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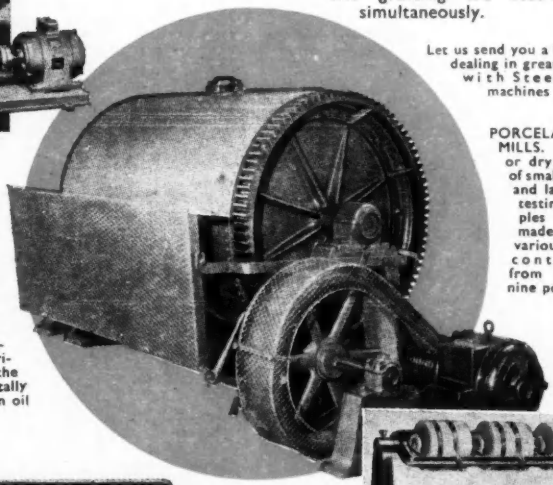

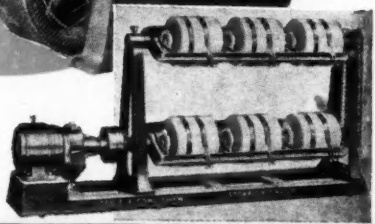

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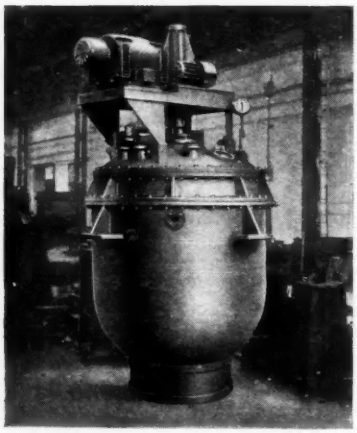

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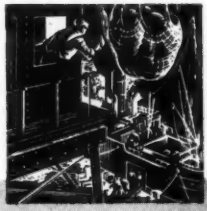

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INDEX TO ADVERTISERS IN THIS ISSUE

	Page
Alumina Co., Ltd. (The)	xiii
Baines, Leonard, & Co.	705
Berk, F. W., & Co., Ltd.	vii
Blundell & Crompton, Ltd.	Cover iii
British Carbo-Norit Union, Ltd.	xiv
British Drug Houses, Ltd.	703
Cannon Iron Foundries, Ltd.	vi
Chemical Engineering Wiltons, Ltd., (The)	Cover ii
Clark, T., & C., & Co., Ltd.	Cover ii
Classified Advertisements	706, xi, xii
Clifford, Charles & Son, Ltd.	iii
" Drum " Engineering Co., Ltd.	Cover iii
Dryden, T., Ltd.	688
Evans, Adlard & Co., Ltd.	iv
Fielding, T. H., & Sons, Ltd.	xii
Frischer, W. F.	688
Gethings & Son, B.	Cover iii
Grazebrook, M. & W., Ltd.	iv
Greening, N. & Sons, Ltd. (The)	v
Greenwich Pump & Plant Co., Ltd. (The)	xiv
Guest, Industrials, Ltd.	viii, xiii
Harris (Lostock Gralam), Ltd.	Cover iii
Haughton's Metallic Co., Ltd.	xiv
Kestner Evaporator & Eng. Co., Ltd.	xiii, xiv
Leigh & Sons Metal Works	xiv
Metway Electrical Industries, Ltd.	x
Orr, George, W., & Co., Ltd.	705
Penrhyn Quarries, Ltd.	xiv
Robinson, L. & Co. (Gillingham), Ltd.	x
Sandiacre Screw Co., Ltd., (The)	688
Shawinigan, Ltd.	ix
Spence, Peter & Sons, Ltd.	i
Steele & Cowlishaw, Ltd.	Front Cover
Sutcliffe Speakman & Co., Ltd.	ii
Swift & Co., Ltd.	viii
Thorn, J. & Sons, Ltd.	ix
Tyrer, Thos. & Co., Ltd.	Cover iv
Wallis, Charles & Sons (Sacks), Ltd.	688
Wilkinson, James & Son, Ltd.	vi
Wilson, Edward & Son, Ltd.	viii
Wood, Harold & Sons, Ltd.	xiv
Wood & Fairweather	xiv

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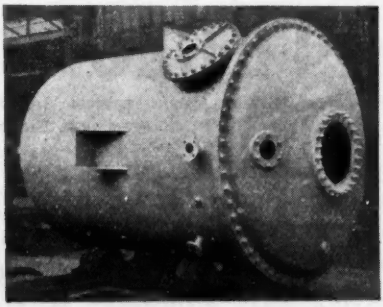

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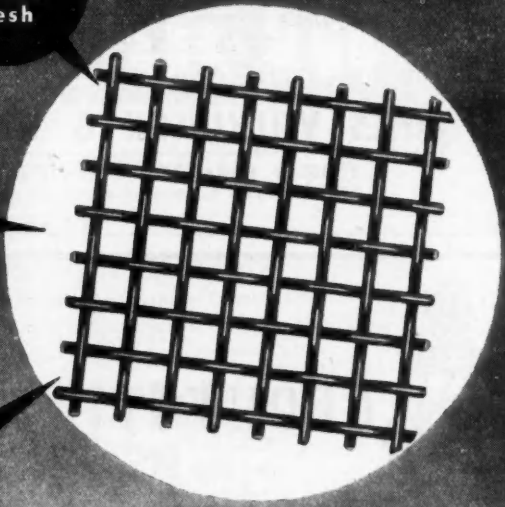

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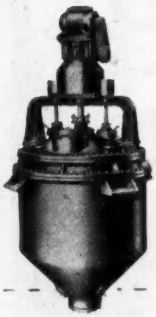

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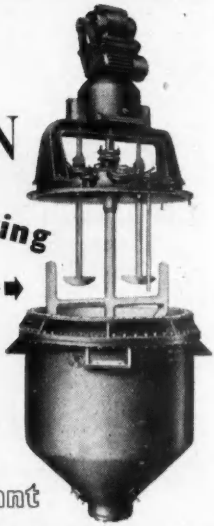

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Volume LXVI 3 May 1952 Number 1712

Uncle Sam, B.S., Ph.D.

IT is sometimes a disadvantage of sectionalisation in our societies that a paper of great general value and interest is read to a limited audience and later finds print only in abstracted form. It is good to note, therefore, that the *Journal of the RIC* (1952, **76**, 2) has published swiftly and in full Dr. Kenyon's lecture on the American chemical profession. British chemists will find this paper most absorbing; as London editor of two world-famous ACS publications —*Industrial and Engineering Chemistry* and *Chemical & Engineering News*— Dr. Kenyon occupies an ideal vantage-point from which to study the differences between organised chemistry in America and Britain.

In many ways the ACS will make a sky-scraping impression upon the British chemist. It is organised on a scale that out-strips anything attempted here, even when the activities of our several chemical societies are added together. For example the ACS holds two national meetings each year; at each of these 800-1,300 papers are presented and average attendance averages more than 7,500—with a peak of 13,500! Here, indeed, this size factor has created most serious problems and the ACS is trying to divide its national meetings between two or more cities. So far, however, a satisfactory solution has not been found. Not only are chemists and employers brought together through a regular employment bureau system, but at these national meetings the bureau functions *in situ;* at the last such meeting 3,705 interviews between prospective employers and employees were arranged. As here, the ACS is frequently invited to co-operate with the Government on technical matters and forms innumerable committees to watch over, and where necessary to influence, such matters as educational curricula, standardisation of materials, etc. But the major activity of the ACS is publication. In 1951 more than 20,000,000 words were published; and members received these at a cost ranging from 1.3 to 4 cents per 10,000 words. In the last six or seven years a change in editorial policy has been gradually introduced. This has involved a building-up of editorial staff to encourage 'publication of the type of material that is difficult to gather by depending upon voluntary contribution.' One development that has emerged from this change is, indeed, the opening in 1951 of the London editorial office by Dr. Kenyon. In addition to this huge publication activity the ACS has maintained since 1917 its own News Service. This steadily expanding section has not only secured increased press interest in chemical subjects and chemists—more

important still, it has secured the confidence of journalists and greatly increased the accuracy of what is written. This activity above all is one that the organised profession in this country should emulate on a vigorous scale. It takes time before newspapers will recognise authoritative news-releasing and fact-providing services and success depends upon two-way understanding; the busy leader-writer or news specialist is certainly not going to be impressed by a committee or panel of experts to whom reference may be made, but he will take advantage of a permanent organisation that is staffed by people who understand his problems as well as their own.

The training of chemists in the United States would appear to follow similar lines to our own, but there is a marked difference in the methods of training chemical engineers. The system developed by Professor Lewis of the Massachusetts Institute of Technology—so frequently referred to in British post-war plans for technological education—has gradually dominated the teaching of chemical engineering in America. This broad approach has replaced the 'industry by industry' teaching of chemical technology and it is claimed that the students produced by it can apply their fundamental knowledge with wide adaptability. There has been considerable debate on this subject in Britain but it is surely difficult to question that our American colleagues have 'got something.' The proof of this particular pudding lies in the doing and it cannot be denied, even allowing for the more speculative tempo of American business in general, that they have been able to fabricate entirely new and large-scale kinds of chemical production at a speed that no other modern country could today hope to imitate. The availability of capital and materials is not the only explanation. However, from 1950-54 (using estimates for the future years) a severe drop in university output of chemists and chemical engineers is facing the United States, and while the U.S. chemical industry is expanding at a striking rate the essential flow of trained personnel is declining. The interruption of conscripted military training appears to be the main cause of this and no agreement to reserve the future scientists has yet been reached.

As for remuneration, a first-sight interpretation is that the American chemist is much better rewarded than his British colleague. But such comparisons are gravely misleading unless the different costs of living in the two countries are taken into account. One comparison seems common to both sides of the Atlantic—although starting salaries for Government employment are reasonably comparable with those prevailing in chemical industry, the salaries paid in later years are much poorer. Chemists with Ph.D. degrees consistently earn more than those with B.S. degrees, the average differential throughout most careers being about 150 dollars per month.

On Other Pages

D.S.I.R. Report for 1950-51 . . 673
Chemical Engineers Annual Meeting 677
B.I.F. Castle Bromwich . . 683
Metallurgical Section:
British Non-Ferrous Metals Research 689
Chemicals Aid in Combating Corrosion . . 691
Welding of Monel Sheet . . 693
Rising Demand for Tin Alloys . . 694
Thermal Conductivity Co-Efficients 695
Chemists' Bookshelf . . 697
Publications and Announcements . . 698
Home News Items . . . 699
Personal . . 700
Overseas News Items . . 701
Next Week's Events . . 702
Law & Company News . . 704

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Notes & Comments

First Quarter's Trade

RETURNS for overseas trade for the first quarter of the year, issued last week, show a slightly encouraging reduction of the overall trade deficit from the appallingly high figure of £302,000,000 per quarter in 1951, to £211,000,000. There are, however, several less reassuring aspects of these figures. One is that the *first* quarter of 1951 showed a lower deficit than the average for the whole year. The second is that the lowering of the deficit is half due to higher prices and only half to increased exports, the value and volume of imports remaining much the same as the average for 1951. As the second quarter of the year will see the recent import restrictions imposed by some Commonwealth countries taking full effect, as well as a seasonal increase in imports to this country, the prospect for trade during this period will depend on how far the further cuts in Britain's imports have succeeded in overcoming these adverse factors. There is no doubt that Britain is still in an exceedingly tight spot, even if the value of the £ abroad indicates that the rest of the world thinks we shall pull through. The danger lies in the fact that while everyone at home can muster the strength to survive a crisis, financial crises nowadays have a habit of dragging themselves out into wearisome and undramatic anti-climaxes. If the sterling area is going to achieve a positive balance with the rest of the world by the end of 1952, as the Conservatives have vowed it shall, there may have to be still further unpleasantness yet, regardless of the number of Trade Union resolutions strongly criticising the Government's cuts and calling for more pay at the same time. The truth is that Government nowadays is primarily a matter of economics, and nobody except economists like hearing about these merciless, irrefutable, omnipotent sets of figures.

Chemical Trade

TOTAL value of exports during the first quarter was 5 per cent above the fourth quarter of 1951 and 11 per cent over the 1951 average, half of this increase being due to higher prices. Imports for the first quarter were 4 per cent lower than the high level for the latter half of last year, but they were still just above the average for 1951 as a whole, the volume being very little different from that average. Of specific chemical exports, the chemical and drugs group was 5 per cent up on the last 1951 quarter, making the total £40,500,000, and non-ferrous metals contributed an extra £5,500,000 on the last quarter of 1951, including special shipments of tin to the United States worth nearly £2,000,000. Rubber exports were better for this quarter than in March 1950, but 1950 was a bad year in Malaya, and since 1951 the first quarter's total has gone down 12½ per cent—a grim tribute to the terrorists. Chemicals, drugs and dyes have increased exports by leaps and bounds, the totals for the first quarters of 1950, 1951 and this year being £23,068,425, £30,016,520, £40,542,202 respectively. Oils, fats and resins show a similar rate of increase. There is no doubt that the chemical industry is a great asset to Britain's financial well-being.

Residual Risks

TWO more of the 'Food Chemicals' conference papers have now been published, and to many people the topic they jointly cover will represent the biggest hazard in the addition of chemicals to food. The papers are by Dr. R. A. E. Galley of the Agricultural Research Council and Dr. J. T. Martin of Long Ashton (*Chemistry and Industry*, 1952, **61**, 342-344 and 345-350). A careful study of these authoritative contributions should disperse the worst of the fears of those who believe that a spray gun is almost as deadly as a Sten gun. For although many of the substances now used to control food-destroying pests and fungi—and also to control crop-com-

peting weeds—are indeed toxic to man, Dr. Galley's survey of their real toxicities and Dr. Martin's study of their conditions of application and residual amounts on harvested food show that the risk from spray remnants is exceedingly small and perhaps insignificant. However, there is a qualifying statement that must accompany that conclusion. The risk is minute only if the proper recommendations are followed. It is perhaps too easy to say that this sort of proviso applies to many aspects of modern life. A car is not a lethal instrument if it is properly driven and all the rules of the road are followed. But there is this difference—bad driving is an obvious type of risk to life or health. The toxic and persistent spray chemical is a technical article that is largely mysterious to the user in garden or orchard. If these marginal or greater hazards of faulty application are to be prevented, far more publicity than is now issued must be distributed in the countryside. The two excellent papers discussed here will not reach more than a handful of growers. Yet how many already know that the use of persistent chemical insecticides on soft fruit carries a greater risk of residue trouble and should, in Dr. Martin's view, be discouraged?

Anti-TB Chemicals

THE arrival of new and highly promising anti-TB drugs was dealt with in a recent issue (CHEMICAL AGE, 1952, **66**, 495-6). Progress is running true to American form, and although the claims of the new chemicals cannot be established until two or more years of further clinical test have passed, production plans for large-scale distribution have already been announced. There are times when this American approach to discovery is difficult to understand. Development research and production development do not keep in step as partners; instead, they seem to be set against each other in the hope that the faster will become the pace-making taskmaster for the slower. But when the fundamental truth is the question whether a new group of chemicals can check or cure tuberculosis, is it right to conduct investigations at break-neck speed? Far too many people suffer from this ailment and it is dangerous to raise hopes too highly until much more is known about the new drugs. Yet within a couple of months of the release of the first story, one important U.S. chemical manufacturer has announced that 40 million tablets of isonicotinic acid hydrazide per month will be in production by the end of May and 100 million by the end of the year. The coal-tar by-product source of the drug has already been swept aside and a multi-step synthesis from citric acid has taken its place. It is said that world demand for the drug has been extremely great ever since its development was announced. Surely it is alarming to contemplate an early and almost indiscriminately wide use of the new chemicals? A possible cure for TB must not be bustled into mistakes and set-backs. 'More haste, less speed' is a trite enough homily, but it applies with remorseless truth to medical research and progress.

American Isotope Farm

LABELLED biological compounds are being produced in commercial quantities by an 'isotope farm' run by the Nuclear Instrument and Chemical Corporation of Chicago, it is reported. Sugars—sucrose, *d*-glucose and *d*-fructose, in addition to rare drugs and bio-synthesised compounds, are available at specific activities. The sugars are produced by growing plant leaves in a controlled atmosphere of $C^{14}O_2$ and subsequently separating the compounds by chromatographic separation in a column, and crystallisation. The results are labelled compounds of over 99 per cent purity.

An algae, *Chlorella pyrenoidosa*, is also grown in a radioactive atmosphere and the labelled product dried and sold. Research is said to be in progress on a commercial method for extracting carotene, chlorophyll, amino-acids and the lipids from the labelled algae. Stock levels of activity are approximately 0.5 millicuries per gram for carbohydrates and algae, and 1 millicurie per mole for other biosynthesised compounds, with higher activities supplied on request. More complicated biosynthesised molecules are supplied at lower activities, depending on the complexities of the synthetic process which produces them.

In the Corporation's laboratories a strict health programme is in operation.

Greater Use of Science Needed in Industry

DSIR Hampered by Recruitment and Building

AN urgent warning that if Britain is again to be prosperous, industry must make science a real and living force in its daily life, is the theme of the report of the Department of Scientific and Industrial Research for the year 1950-51, published by Her Majesty's Stationery Office (Cmd. 8494. 7s. 6d.). Far-sighted men on both sides of industry, the report concludes, realise the need for a greater use of science, but there are still too many cases where both sides alike are apathetic.

There is no need to learn this lesson, as has too often happened in the past, through bankruptcy and unemployment, but time is getting short.

Attention is drawn to the delay in realising the post-war plans of the DSIR, which have already been seriously hampered, especially by difficulties in recruitment and building; but these problems are now gravely accentuated by the needs of rearmament.

The pace of scientific and technological advance has become faster and the competition British industries have to meet in the world's markets has grown sharper. While it is, of course, appreciated that priority must be given to rearmament, nevertheless, rearmament itself and the whole economic future of the country, depend on a highly efficient industry.

Obstacles must be Removed

It is therefore urged with the utmost emphasis that special steps should be taken at once to remove the obstacles to the development of the DSIR's post-war plans at a pace that is required alike by both the defence and economic future of the country.

Part of this post-war project was a substantial building programme which, at to-day's prices would be about £10,000,000. The programme comprised the provision of laboratories for mechanical engineering research, which would serve those industries which are concerned with rearmament and also responsible in the aggregate for exports of over £744,000,000, and also for hydraulics research for which there is no centre in Britain.

Extension of certain existing establishments and the re-housing of others were also planned, but progress has been extremely disappointing. Year by year expenditure has lagged behind schedule, and when at length it seemed possible that the rate of expenditure could be raised to the agreed level of £1,000,000 a year, a severe cut was imposed, and it is doubtful whether expenditure would reach £500,000 for the year 1951-52.

Other examples quoted in the report to illustrate the need for Government action at high level to overcome the difficulties which are holding up the DSIR building programme, include a water pollution research laboratory and a ship tank.

Effluent Research

Research on the treatment of water, sewage and trade effluents is essential for the nation's health, and for the conservation of its water resources, while the recovery of valuable products from waste waters is of growing economic importance. Water pollution research is at present carried out in a house at Watford and in huts in the grounds of the Building Research Station. This accommodation is quite inadequate.

A site for a new station has been secured at Stevenage, the Development Corporation of which is anxious to help. Tenders for the erection of the new laboratory were obtained by the Ministry of Works at the end of 1950, but the letting of the contract was deferred for a year on Government direction. The hope is earnestly expressed that no further deferment will be required. Staff cannot do their best when compelled to work in overcrowded and makeshift laboratories.

Britain, which builds one-third of the world's shipping lacks an up-to-date 'tank' and ancillary equipment for studying the design of ship's hulls and propellers, such as the U.S.A., the U.S.S.R., Holland and Sweden possess. The two obsolescent 'tanks' at the National Physical Laboratory cannot meet the needs of the industry for the tests for which it pays. Cost of a modern tank is estimated at £2,000,000. An admirable site has been secured and construction should be begun without delay.

When the DSIR's post-war plan was approved in 1946, the full cost was estimated at about £4,000,000 per annum. Prices have risen substantially since then, and the full cost is now estimated at £7,500,000 per annum at present prices. The utmost economy in Government expenditure is imperative, but it would be no economy to delay, let alone abandon what are firmly believed to be essential developments in the country's scientific and technical resources.

In particular, no attempt should be made to hold DSIR's expenditure at any given level, say that for the current year. The effective planning of research must be based on reasonably firm budgetary expectations for several years ahead. It cannot be undertaken efficiently on a year-to-year basis, since long-term commitments have to be entered into if the resources of the Department are to be used to the best advantage.

Effect of Cuts

Sudden and unexpected limitations or cuts in the Department's budget, especially in periods of rising prices, must enforce more than proportionate retrenchment in those parts of the Department's work where there is least commitment. Yet that may well be just where retrenchment is least desirable. It would, for instance, seem unwise to sacrifice the development of the most recent work; to fail to maintain normal recruitment to the Department's establishments; or to reduce the number of maintenance allowances to post-graduate students that play so big a part in the building up of scientific manpower of the desired quality in this country. In all these cases it is considered the loss would be out of all proportion to the money saved.

The task of the DSIR at the present time is to ensure that research makes the greatest possible contribution to the carrying through of the rearmament programme and at the same time to maintain national economy. Two matters of immediate importance are the supply of raw materials and the raising of industrial productivity.

Technical surveys on the sulphur and sulphuric acid position, and the consumption of zinc and copper, and substitutes for non-ferrous metals have been supplied to the Ministry of Materials.

In recent technical literature from America, the use of ion-exchange resins, the discovery of which was made in the Chemical Research Laboratory, has figured prominently, and the possibility of using this technique for the recovery of waste products, in particular non-ferrous metals, is under examination.

Limitations on capital investment, the report points out, act as a brake on the exploitation of scientific advances, and foster those types of research which are likely to yield improvement without major capital outlay. Such work includes the better use of men and machines by the adoption of new and improved production engineering techniques and the study of human factors affecting industrial production.

An increasing number of DSIR Establishments and Research Associations are engaged in productivity surveys, and interest in them has been widened by a series of meetings, both domestic and international, at which techniques in this new field of investigation have been described and discussed.

Chemistry played a prominent rôle in the work carried out during the year by the 14 research organisations under the Department's control and by the 41 autonomous research associations in receipt of grants from the DSIR.

Work at the CRL

Work of the six research groups of the Chemical Research Laboratory, the report states, is of two kinds: firstly, fundamental long-term work within the laboratory's own programme, and, secondly, work on request by other organisations. It is inevitable that the ratio of effort in these two categories should vary according to circumstances. The present trend is towards an increase in request work for Government departments, particularly on problems related to the work already forming part of the research programme, where the experience of the staff provides a fundamental background of knowledge.

In the Corrosion of Metals Group research on immersed corrosion includes studies of the influence of surface finish on the corrosion of mild steel, and the behaviour of low alloy steels in static and moving conditions.

The development of sodium benzoate-sodium nitrite inhibitor is an example of an *ad hoc* research which led on the one hand to fundamental study of the mechan-

ism of inhibition of corrosion, and on the other hand to the use of the inhibitor in the production of special packaging material for the protection of machined parts.

In the Inorganic Group further investigations are in progress on high temperature conversion of rock phosphate, a study of the production and analysis of very pure germanium and the preparation of high purity gallium.

A substantial part of the present programme of the Organic Group is intended to meet the requirements of industries handling organic materials for reference purposes and for fundamental physico-chemical data on such compounds. During the past two years much effort has been put into a scheme for the provision of standard hydrocarbon samples of certified purity. Another activity, which is of direct interest in industrial problems, is the synthesis of organic compounds containing carbon isotopes.

The programme of work on the analysis, extraction and recovery of valuable metals from radioactive minerals and ores is being continued in the Radiochemical Group, while in the High Polymers Section a complete separation was recently achieved of a mixture of β- and γ-resorcylic acids obtained by the carboxylation of resorcinol.

Microbiological Methods Important

There is no doubt that microbiological methods, allied with chemistry, will be of increasing importance in the years to come, and a considerable extension of the work of the Microbiology Section at the CRL is envisaged. The National Collection of Industrial Bacteria continues to increase. Specimens now held number more than 500, and some 830 specimens have been supplied to laboratories in all parts of the world.

Wood chemistry studies at the Forest Products Research Laboratory are continuing on the chemical analysis of Colonial timbers. Other subjects of practical significance are the question of substitute timbers in the chemical industry, corrosion problems where wood is used in association with metals and the chemical effects of weathering in normal and polluted atmospheres.

At the Fuel Research Station the Fischer-Tropsch process as a means for producing liquid fuels and aliphatic chemical products from coal is being studied with a view to its possible commercial application in Britain or other parts of the Commonwealth. Fundamental work has been begun to provide information about the physical and chemical structure of the surfaces of solid particles involved in catalytic and combustion processes.

Study of the Fulham-Simon-Carves ammonia process for the removal of sulphur compounds from boiler flue gases is continuing. A pilot plant to treat 25,000 cu. ft. of flue gas per hour has been completed and work is in progress to improve the design and method of operation and to provide data for full-scale plant if the process can be made reasonably economic. Other processes are also being considered.

Pollution Observations

Some 900 continuous observations of atmospheric pollution are being made by local authorities and other bodies in various parts of the country. The Station is responsible for the collection, collation, and publication of the results of these measurements, and for giving advice and assistance in various ways, including the selection of suitable apparatus and observing sites, and the interpretation of results.

The volume of routine test work undertaken by the National Physical Laboratory shows a considerable increase. The work on the temperature dependence of creep for an aluminium alloy has reached the report stage, and the time dependence of creep is being currently studied. Theoretical and experimental studies of creep due to fluctuating stresses are proceeding and a paper on the subject has been published. An entirely new design of fatigue testing machine operated by a swash-plate has been constructed which can test 24 pieces simultaneously at load ranges up to 50 lb.

Insect pest in stored foodstuffs continue to be the main concentration of the Pest Infestation Research Laboratory, although more time is being given to the study of 'domestic' insects, including flies, carpet beetles, and clothes moths.

Demands on the Water Pollution Research Organisation are heavy and increasing, and there is urgent need for additional accommodation.

It has been known for many years that the Thames estuary is seriously polluted. In hot, dry weather the water in the central reaches is almost or entirely devoid of dis-

solved oxygen and under these anærobic conditions quantities of gas, including methane and hydrogen sulphide, are evolved.

In 1951 a Departmental Committee was set up under the auspices of the Ministry of Local Government and Planning 'to consider the effects of heated and other effluents and discharges on the condition of the tidal reaches of the River Thames, both as at present and as regards any proposed new developments in the area'.

The Department was asked to investigate the condition of the estuary water and the effect of various factors on it so as to provide information on which the Departmental Committee could base its recommendations. A considerable proportion of the resources of the laboratory is now being given up to this work.

BCURA Research

Laboratory scale work on the production of phthalic anhydride and other organic acids by the fluidised flow catalytic oxidation of phenanthrene has been brought to a successful conclusion at the British Coal Utilisation Research Association, and is now available for industrial development. Work on the catalytic inter-conversion of phenols has also been concluded, and the considerable body of information obtained is being prepared for publication.

Attention has now been turned to physico-chemical studies of solvent extracts of coal, undertaken with a view ultimately to converting these substances directly to chemical raw materials, including carbonaceous products, and of using them in the manufacture of other industrial materials.

Coal extracts obtained with various amine solvents have been used with promising results in the production of porous refractories and reactive chars, for cementing of carbon bodies and for the production of carbon black. The application of solvent extraction and techniques of X-ray examination to the characterisation of coals has been continued as a basic study.

As a result of the present shortages in the supply of sulphur the British Coke Research Association has been asked to assist in the development of improved methods of sulphur recovery in the coke industry. An examination of existing processes is being made with a view particularly to selecting for further development those processes which appear to be economically promising.

Special interest attaches to the recovery of sulphur in the elemental form, but it appears more practicable, as far as the coking industry is concerned, to recover it in the form of sulphuric acid.

The problem of sulphur in coke is complex and its study forms part of the normal programme of research. Work is in progress at the regional establishments on the development of analytical methods for the determination of the various forms of sulphur in coal and coke and on the possibilities of influencing sulphur content during and subsequent to carbonisation.

Fundamental and development work aimed at the ultimate reduction of sulphur in metallurgical coke is also in hand.

A study of the methods used for estimating the gloss of paints has led to the development of an improved type of photoelectric glossmeter, now in routine use at the Paint Research Station.

The circumstances of industries, and their importance in the national economy, vary greatly, and many factors need to be taken into account in assessing grant at different stages of the growth of a research association. Among the associations for which new terms of grant for the next five years are recommended is the British Scientific Instrument Research Association.

After a period of extremely small profits during the inter-war years, the industry had to cope with large demands for its products during and following the war. It is considered that the association should continue to receive special terms of grant, but the industrial contribution should be considerably increased.

95 Special Investigations

At the beginning of the year the department was supporting 95 special investigations at universities, including two important projects at Manchester and Cambridge relating to the development of research in radio astronomy, and a scheme has been submitted for the construction of a steerable radio telescope at Jodrell Bank, where the Manchester work is done by Professor Lovell.

The advisory council 'earnestly trusts' that it will be possible to proceed with the project, since the pioneering work done in this comparatively new field has given Great Britain a lead which must be maintained.

Future of Chemical Engineering

Responsibilities of the Institution of Chemical Engineers

THE importance of the chemical engineer and his vital rôle in helping the co-ordination and application of new techniques was the theme of the speeches at the 30th annual corporate meeting and annual dinner of the Institution of Chemical Engineers held at the May Fair Hotel, London, on Friday, 25 April.

At the meeting the election of the following officers was announced: *President*: Stanley Robson; *vice-presidents*: W. A. Damon, A. G. Grant, R. Edgeworth Johnstone and Professor E. C. R. Spooner; *hon. secretary*: L. O. Newton; *hon. treasurer*: F. A. Greene.

Following the meeting an address was given by the retiring president, Sir Harold Hartley.

Sir Harold chose as the subject of his presidential address 'Chemical Engineering at the Cross Cross-Roads' and, briefly, it was as follows:—

I was able, last September, to return the welcome visit we had from Dr. Chilton, the President of the American Institute, in July, and to discuss many problems with our American colleagues. In March I went to Johannesburg for the inauguration of our South African branch and saw something of chemical engineering developments in the Union. During the year I have been to meetings of our home branches and of the Graduates and Students Section and I have visited a number of chemical engineering schools in this country.

Vast Expansion

The 20th century has seen a vast expansion of the chemical industry, with the rise of scientific methods of oil refining and of a great industry based on refinery gases and natural gas together with the production of synthetic fibres and plastics. But of equal significance has been the invasion of chemical techniques into the processing of many natural products, food, wood, rubber and leather, and into the fermentation industries, which they have revolutionised. The extractive industries have become chemical industries.

At the approach to cross-roads one expects to find signs and warnings and there is no lack of them here—the Hankey Report on the supply and demand for chemical engineers in Britain, the Dunsheath Report of the Productivity Team that investigated the relations between universities and industry in the United States, the Cremer Report of the Committee on Chemical Engineering Research, and finally the recent discussion in the American Institute of Chemical Engineers on 'Whither, Chemical Engineering Science?'

U.S. Courses Impressive

The Dunsheath Committee were 'impressed by the extent courses in chemical engineering have been developed in America and by the extent to which these courses are regarded as meeting a widespread demand from various branches of American industry'. The number of courses in chemical engineering is exceeded only by those in civil, electrical and mechanical engineering and in 1949-50 the number of first degrees granted in chemical engineering was 4,529.

From the Hankey Report we learn that the annual output of chemical engineers from all sources in this country between 1950 and 1954 is estimated at 200. The comparison between this figure and the output in the United States speaks for itself. There is no need to emphasise the urgent need for a rapid increase in the number of chemical engineering courses at our universities and technical colleges, and an expansion in the size of existing courses where possible. The gap is far too large to be dealt with by any new technological university, and wherever engineering courses are now given, it seems only reasonable that undergraduates should have an opportunity to study chemical engineering if they so desire. I have been much impressed by the excellence of the courses in chemical engineering which already exist, and by the friendly and co-operative relations existing between the chemical engineers and the older schools of chemistry and engineering. So that in spite of the present disparity in numbers, I am optimistic that the future need to multiply and expand the courses in chemical engineering is recognised as most urgent both by the universities and by the

Sir Harold Hartley, retiring president of the Institution, Lady Hartley, Lady and the Rt. Hon. Lord Woolton, and Mr. John Rogers at the reception before the annual dinner

financing University Grants Committee.

The Cremer Committee was appointed to report on the position of chemical engineering research in this country. After reviewing the existing facilities and taking evidence from over a hundred firms and research associations, it reached the conclusion that 'existing facilities are inadequate for the purposes of the chemical and allied industries as a whole', and it decided that the analytical approach requires a central organisation specially adapted for this purpose, where under some co-operative scheme with industry the data from large-scale operations could be collected, analysed and quickly made available as a basis for plant design.

My own conviction is that the conclusions of the Cremer Committee do not go far enough in one respect. I am certain that the analysis of the results of plant operation will throw up gaps in our knowledge which can only be filled by experimental investigations on large-scale pilot plant for which a laboratory will be needed. That to my mind is an essential constituent of the organisation that is needed in order to get the full constructive benefit from the analytical survey of plant operation which is proposed. Such a laboratory would be, too, a most valuable corollary to the more fundamental work in progress in university departments.

I will go further and say that until we recover the initiative in chemical plant design and construction, we shall be forced to buy the 'know-how' at a high cost from abroad, and it will not be the latest 'know-how'. We can only regain that initiative by analytical and synthetic research, for the co-ordination and application of which the organisation recommended by the Cremer Committee is essential. Without it we shall not benefit from the results of our own scientific research, which in the past have so often been exploited abroad.

The only move towards implementing the recommendations of the Report so far is the decision of the Department of Scientific and Industrial Research to publish a series of critical bibliographies on particular aspects of chemical engineering techniques. The first will deal with methods of industrial drying and the second with grinding methods and the dispersion of solid particles. The Institution has been asked to nominate a small expert panel to help in this work. This will certainly be a most useful contribution, but there remains the urgent need for the organisation envisaged in the Cremer Report to collect, co-ordinate and publish the results of plant operations, together with a pilot plant laboratory. Without this our design and construction industry will be seriously handicapped.

With the inevitable gradual exhaustion of fossil fuels, great hopes are based on the use of nuclear energy in the future. Whether these hopes are likely to be fulfilled I will not venture to predict but one thing is certain; their fulfilment will depend largely on chemical engineering.

Solar radiation is an even more potent

and ever-present source of energy. It is the basis of existence of living organisms but we make so little use of it today. With the depletion of fossil fuels it is inevitable that the day will come when man must harness the sun's rays. How and when that will be done will depend on advancing knowledge. Whether it will come through photosynthesis, through photoelectricity or through fuel cells free from the inevitable limitations of the thermo-dynamics of the heat cycle, or other means, no one can say, but when it does I venture to predict that the techniques of chemical engineering will play their part.

Two facts emerged very clearly at the United Nations Conference on Resources at Lake Success in 1949; first the growing consumption of metals with the spread of industrialisation and second, our increasing dependence on lower grade ores. Known reserves of non-ferrous metals will provide for, say, half a century at our present rate of consumption, pointing in the long run to a steel and light alloy economy with non-ferrous metals reserved for essential purposes. Chemical engineering has already contributed much to the ore dressing of low grade ores, and to the extraction of metals from them.

The 20th century has seen great changes in the nature and the use of raw materials in industry, in which chemical engineering has played its part. One major trend has been the processing of natural materials like rubber and leather as their chemical and physical nature has been better understood. The scientific control of their manufacture has resulted in improved quality and greater uniformity of the products.

Another major trend has been the rapid development of synthetic materials, in some cases in competition with natural materials, in others in partnership with them. These synthetics are all carbon compounds manufactured from coal, oil or natural gas or from natural materials such as cellulose or proteins. Fibres and plastics are two of the main developments. Synthetic fibres—rayon, viscose, nylon, ardil and terylene—often spun with wool or cotton, help to meet the world's ever growing need of textiles.

The field for plastics is widening daily. One of the newcomers, polystyrene, has already reached a production of over a quarter of a million tons a year. Incorporated with synthetic rubber it replaced leather in 1950 in roughly half 500,000,000 pairs of shoes in the United States alone. Catalysis plays such a vital part in so many of these plants that one asks the question 'Are there limits to the use of man-made catalysts?'.

You may think that I have strayed from my subject but in view of all this I return to ask how chemical engineering is to play its part in future in helping to meet the world's needs for these complex molecules: clearly not by competing with nature, but

The president and Lady Hartley receiving Mr. and Mrs. L. P. O'Brien. Mr. O'Brien is president of the Association of British Chemical Manufacturers

Mr. and Mrs. Norman C. Fraser

by a more intimate partnership with her.

What forms will that partnership take? First the help that agriculture will derive from improved fertilisers, from new weed-killers, fungicides and insecticides, from new antibiotics to eliminate disease in man, and animals and plants and possibly from substances which modify the soil structure to give those optimum conditions on which the crop yield so much depends.

Next there is the development on which I have already touched, the processing of food products to up-grade and preserve them and facilitate their transport, together with the processing of farm residues thus 'converting a disposal problem into a disposable income'.

But lastly and of most significance for the future is the partnership in what is properly called bio-chemical engineering, a partnership in the activities of living cells working in man-made environment. I use the hyphen deliberately because it is not a new form of chemical engineering but the adaption of its techniques to meet the conditions imposed by the living organism.

In a survey of this nature, whether one looks at the immediate or the more distant future, one is driven to the conclusion that the world must depend more and more on chemical techniques in order to utilise to the full the limited resources of our planet so as to meet the needs of its growing population. To do this the chemical engineer is bound to play an increasing part in partnership with the older branches of engineering. In any project he will be the liaison between the research laboratory and the team of engineers, the co-ordinator of their contributions.

The thought running through my mind, in the light of all this, is the seriousness of our responsibilities as members of this Institution—our responsibility as the qualifying body for maintaining and enhancing the traditions of the profession of chemical engineers, our responsibility for encouraging schools of chemical engineering and for making public the urgent need to increase the output of chemical engineers, and finally our responsibility to provide opportunities for the discussion and publication of contributions to knowledge in our field.

It was largely by engineering skill and invention that Britain won its place among the nations during the Industrial Revolution, and it is in these same fields, in this second Elizabethan age, that our strength still lies. Chemical engineering, the newcomer, is not competitive with the older branches of engineering but complementary to them. It is a fourth primary technology, dependent in many ways on the other three, and destined to play an increasing part in the competitive strength of British industry.

The Annual Dinner

Many distinguished members and guests attended the annual dinner of the institution which was held in the evening following the conclusion of the 30th annual corporate meeting.

The toast of 'The Institution of Chemical Engineers' was proposed by the Lord President of the Council, Lord Woolton, C.H., who began his speech with some light-hearted references to his long association with Sir Harold Hartley whom he had known in a number of different capacities.

It was only recently, Lord Woolton confessed, that he had become fully aware of what a chemical engineer was, but he was glad to be able to appreciate the important part they played in bringing science into active partnership with industry.

Britain was at present passing through a difficult era and the solvency of the nation would depend upon her capacity to trade throughout the world. The need for hard work had been stressed by many people, but speaking to the industrialists, of whom he used to be one, he would like to

emphasise the need for them to bring the scientists into their works.

If their works were not big enough to employ scientists, then it was up to them to get in touch with such organisations as the Department of Scientific and Industrial Research and so take advantage of the knowledge that science placed so freely at their disposal.

By doing so they would not only improve their own businesses and their own prosperity, but what was even more important, they would be helping to improve the welfare of the country.

Responding to the toast the president, Sir Harold Hartley, expressed his gratitude to Lord Woolton for his speech and said there were many reasons why he was such a welcome guest. In the first place as the Lord President of the Council he was responsible for the formulation and execution of the Government scientific policy, a matter which concerned the institution very closely, and they had been delighted to find the extensive interest which he was taking in the scientific work of this country and the clarity with which he could see the dependence of our future on the closer link between science and industry. It was a pleasure also to greet him as the Chancellor of the University of Manchester, not forgetting that Manchester had just resolved to appoint a Professor of Chemical Engineering.

All the members of the institution were in close touch with the Minister's Department, and with their good friend Sir Ben Lockspeiser, and when Lord Woolton had been speaking a few days earlier he had talked of making ends meet and of the great effort which was required in this country to enable that to come about. That had recalled to Sir Harold's mind an incident at a dinner at which he had been present many years previously, when he had been sitting near Andrew Lang and the then dramatic correspondent of *The Times*, to whom Andrew Lang had said 'I see you are still burning the candle at both ends', and the reply had been 'I have to—to make them meet'. That was some measure of the effort which was required from every person in this country to meet the present difficult conditions, and he felt quite sure that effort would be forthcoming under the inspiring leadership of our Prime Minister, and that chemical engineering would play a great part.

On his recent visit to South Africa he had the privilege of presiding over the inaugural meeting of the South African branch of the institution, which was a great moment because it was the first overseas branch to be established, but he hoped it would soon be followed by branches in other Dominions. It had been a most heartening experience to see the great developments which were taking place in South Africa, a country blessed with almost all the things which

Dr. and Mrs. George Foxwell and Dr. and Mrs. Pratt. Dr. Foxwell is president of the Institute of Fuel

everyone wanted. In that country, as elsewhere, the demand for chemical engineers far exceeded the supply.

In this country, too, there was a shortage, and he wished to make an appeal to women. Out of 2,700 members he had discovered that there were only four women. With the invasion of all occupations by women it seemed that here was a great opportunity for them to make good some of that shortage.

Osborne Reynolds Medal

He now had a very pleasant duty to perform, that of presenting the Osborne Reynolds medal, which they owed to the generosity of their treasurer, Mr. Greene, to his old friend and colleague, Dr. F. A. Freeth. Dr. Freeth had made great contributions to chemical engineering, both in the old days and, more recently, in Imperial Chemical Industries. It had been his researches which had played such a vital part in providing explosives in the first World War. He had also led a mission to Germany immediately after the Armistice in 1918 in order to ascertain what had been happening in the German factories during the war, and the resulting White Paper had a decisive influence on the progress of chemical work in this country because it had revealed the great strategic strength, both in peace and war, of the German industry.

The Osborne Reynolds medal was awarded by the Council of the institution for the most meritorious contribution to its progress during each year. Dr. Freeth had been chairman of the Publications Committee since 1948 and it was due largely to his efforts that their publications were up to date and were appearing in their excellent new form.

Responding to the toast of 'The Guests,' Mr. John Rogers, O.B.E., LL.D., said that in this country the big chemical companies had not paid attention to the institution in the manner in which they ought to have done. He had recently returned from a visit to America and Canada, where the chemical engineer had become established to a very great extent, particularly on the development side of the business.

Canada was a country of a tremendous future. The oil industry in the Dominion was a great field for chemical engineers because some of it was bound to be converted into chemicals, either on the spot or after it had been taken through pipe-lines, and the natural gas would be used for heating and lighting and for various chemical processes, in the design and development of all of which the chemical engineer had a very clear place. The Canadians and Americans knew that very well, but the firms in Britain had not so far employed chemical engineers as they should have done, although probably they would learn from Canada with the aid of the institution.

It appeared to him that in Canada there would in the future be a great city somewhere in the region of Edmonton. The U.S.A. had piped the oil from Texas and Oklahoma up to the north but the distance was very much greater to bring it from Alberta to the border. It was a big problem for Canada but it would mean a great deal to the country and in his opinion, in due course, there would be an international arrangement between the U.S.A. and Canada. One could not conceive of oil being brought to the border from the north without the utmost co-operation, or that south of the border it could be short while the north had plenty.

Canadian Opportunities

A great deal of money was being poured into Canada from America and, to the extent of their capacity, from Switzerland and Belgium. The dollar situation in this country was very difficult, but it was up to us to help along their expansion as far as we could, and young men who were finding things difficult here for one reason or another could not do better than go to Canada and take part in that advance.

In inviting his successor, Mr. Stanley Robson, to take his place, the retiring president said he was a distinguished chemical engineer who had made great contributions to their science, and with his great experience, wisdom and personal charm which had endeared him to them all there was no one better qualified to undertake his responsible position. On behalf of all the members he wished Mr. Robson a happy, prosperous and successful term of office.

Mr. Stanley Robson replied that he was deeply sensible of the honour which had been conferred upon him. He had seen the Institution of Chemical Engineers develop from small beginnings and to be in the succession of those who had achieved that great service to industry made him very proud.

B.I.F.—CASTLE BROMWICH

CHEMICAL engineering and the chemical and allied trades will again be well represented in the engineering and hardware section of the British Industries Fair which opens at Castle Bromwich, Birmingham, on Monday next (5 May).

The four main applications of its products—aeration, filtration, diffusion and electro-chemical processes—will be demonstrated by **Aerox, Ltd.** A feature of the stand will be an aerating tank illuminated by tube lighting and equipped with three different grades of 'Porsilex' aerators, which may be used for practically all categories of air, gas and liquid filtration for pressures up to 5,000 p.s.i. Diaphragm plates 30 in. sq. with a wall thickness of three millimeters made of the new 'Celloton' material are much used in electro-chemical processes. This new medium, which will be on view, combines higher porosity with lower permeability while retaining its mechanical strength factor.

Shown for the first time on the stand of **Edgar Allen & Co., Ltd.,** will be a 24-in. diameter circular saw which has proved exceptionally successful in the sawing of magnesium and aluminium. A wide range of steels for dies working on aluminium, copper base alloys and so on, will be on view, and an interesting display will be presented by the engineering department consisting of a revolving model of a Stag tube mill for fine grinding. Representative magnets for scientific instruments and electric clock mechanisms will also be on show.

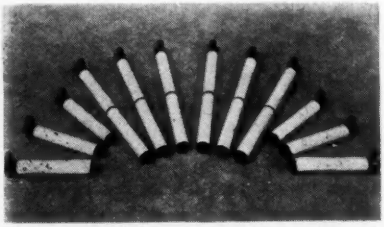
Industry today places immense reliance upon plastics, and **Bakelite Ltd.** manufactures them in many forms to provide essential components for most branches of production. The company pioneered the development of phenolic moulding materials in Britain and today is the largest producer of them in Europe. In addition, it manufactures 'Bakelite' industrial and 'Warerite' decorative laminates, 'Vybak' calendered sheet and thermoplastic moulding materials, and 'Bakelite' adhesives, lacquers and varnishes. All of these are based on synthetic resins and are to be seen on the stand both in their 'raw material' state and as the finished products into which they are transformed under heat and pressure.

Problems of industrial adhesion and sealing where products are liable to be subjected to stress and strain, water and oil, or extreme atmospheric conditions are the concern of the **B.B. Chemical Co., Ltd.,** which will be displaying a wide range of its 'Bostik' adhesives and compounds.

Steel drums for the chemical, oil, and paint industries, an industrial steel sink, and examples of aluminium welding will be among the items featured by **Fredk. Braby and Co., Ltd.** The stand, which was designed by the company, will be constructed of 'Bar-Form' metal partitions.

The low fire hazard with Geon PVC in all forms will be underlined in the display by **British Geon, Ltd.**

A selection of its B.J-D breaking, crushing, pulverising, and grinding machines for friable and semi-friable materials to suit product requirements from 8 in. cube down to minus 300 B.S. mesh in capacities from a few hundredweights to hundreds of tons per hour will be seen on the stand of **British Jeffrey-Diamond, Ltd.** Several of



Horizontal diffusers employing 'Porsilex' aeramic elements with ebonite fittings as used in many reaction processes, shown by Aerox, Ltd.

the machines can also be adapted for reducing fibrous materials.

Contributions towards developing industrial processes of all kinds made by the **British Thomson-Houston Company** will be exemplified on its stand, including electronic equipment, while its research will be represented by a demonstration of the high sensitivity of lead sulphide cells to infra-red radiation from bodies at temperatures as low as 100° C. The cells have a high-speed response and are thus eminently suitable for applications where very rapid temperature changes have to be followed, or where temperatures of objects in rapid motion have to be ascertained.

Saving of costs in transport, distribution and storage charges are claimed by the use of polythene flexible bottles and containers and polythene layflat protective packaging which will be on view at the stand of **Cascelloid, Ltd.,** manufacturers of injection mouldings to all trades.

Why battery-powered electric trucks? People in industry seeking an answer to this question will find on the stand of **Chloride Batteries, Ltd.,** not one but eight good reasons why they should investigate the possibilities of this most efficient form of mechanical handling. Another section of the stand will be devoted to Keepalite, the original automatic emergency lighting apparatus.

Every chemist and other technician will find the display of porous ceramic materials by **Doulton and Co., Ltd.** worthy of close inspection. The long list of their applications, which is constantly being added to, includes filtration, aeration or diffusion, electrolysis, absorption and other processes. A special feature this year will be a new type diffuser material which may be used in water and in many aqueous solutions available in any of the standard grades. By choice of the correct grade one can ensure that no liquid enters the pores either when gas is being diffused or during periods of idleness. Further advantage of the material is elimination of bubbling pressure, which means that gas pressure in supply need only be sufficient to overcome the hydrostatic head of liquid above the diffuser and the normal resistance of the material itself to fluid flow. The reduction in working pressures and the fine state of division of the diffused gas both contribute towards saving in gas consumption and in cost. A diffuser illustrating the properties of this material will be seen in operation in a model on the stand, and other samples will be available for inspection.

New productions which will be seen on the stand of the Special Products Division of the **Dunlop Rubber Co., Ltd.** include a range of polyvinyl acetate emulsions for paint manufacture and S.480 reclaim cement, an adhesive which supersedes the old types of black adhesive previously in use. Exhibits by the General Rubber Goods Division of the company on another stand will include: butyl, polyvinyl-chloride and neoprene linings; oil hoses; expansion joints and microporous separators.

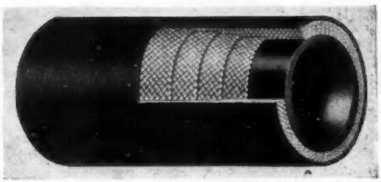
An outstanding exhibit of process control division of **Elliott Brothers (London), Ltd.,** activities will be a section of a large and comprehensive instrument installation for automatic control of furnace temperature for the continuous weld tube mills at Stewarts and Lloyds, Ltd., Corby. The furnaces of this plant are producer gas and oil fired and the instrumentation demonstrates the versatility of the Elliottrol trimode controller and associated equipment, which is used for automatic control of fuel flow, air/fuel ratio and recuperator temperature. Other Elliott instruments featured prominently in this installation are the Elliottronic potentiometer recorder and recording flowmeters. The equipment is notable for the provision of safety devices which include a comprehensive system for giving audible warning of high furnace temperature, thermocouple failure or other dangerous conditions, together with emergency shut-down facilities. The electrical measuring instruments division will be showing a wide range of fixed and portable recording apparatus including volt-

meters, ammeters, wattmeters, frequency and kVA recorders, while electronic equipment and magnetic amplifiers will also be on view.

The many miscellaneous purposes for which fuller's earth and products made from it can be used will be demonstrated on the stand of **The Fullers' Earth Union, Ltd.** The main exhibits will be 'Fulbond' for bonding foundry sands and 'Fulbent' used for well drilling, emulsifying and suspending, and activated fullers' earth for oil refining and waste oil regeneration.

Prominent among the new appliances to be shown by the **Gas Council** is a prototype crucible furnace specially made by the East Midlands Gas Board. This makes use of radiant burners, instead of the more usual tangential firing, with a consequent increase in pot life. An example of the use of radiant heat will be seen in the infra-red blacking dryer of Thomas de la Rue & Co., Ltd. The use of this method of drying paint and other coatings is claimed to save from 80 to 95 per cent of time in comparison with methods dependent upon convection heating, with consequent savings in fuel, savings in space and maintenance costs. Metal spraying and glass working exhibits will be featured on another section of the stand. The metal spraying display will be a demonstration of the use of the spray gun for building up metal components, such as crankshafts, which have been partly worn away by constant use. The glass working exhibit will show the use of oxy-coal-gas blow pipes for the manual working and shaping of laboratory and industrial glass ware, such as is used in atomic research, the iron and steel industries and the gas industry. The Coke Department of the Gas Council will have its own stand at Castle Bromwich, with exhibits showing the automatically fired and controlled coke burning appliances for central heating and small steam-raising plants. Of particular interest will be a full-scale sectioned automatic coke-burning furnace used to supply heat at closely regulated temperatures for industrial applications, such as the direct drying of materials or for process work such as lime burning and liquid heating in heat exchanges.

The story of its Research Laboratories, the tools used, results achieved, and their function within the company's large manufacturing organisation will be featured by **The General Electric Co., Ltd.** The stand



Cross-section of hose for acid delivery demonstrated by the Goodyear Tyre & Rubber Company

will be divided into two parts, first showing the 'tools of research'; second the 'products of research'. In the section dealing with tools of research will be seen graphs and illustrations designed to show the size of the laboratories and their annual expenditure; and eight main fields of activity—electrical engineering, heating and ventilating engineering, mechanical engineering, illuminating engineering, physics, chemistry, glass technology and metallurgy. Four tools of research used at the laboratories will be shown and their functions illustrated by working exhibits: a spherical integrating photometer, a turbine vibration test set, a vacuum pump system, and a valve vibration life-testing machine.

An ultrasonoscope for the detection of flaws in metals, materials, welds, etc., developed under the auspices of the Ministry of Supply will be a prominent exhibit on the stand of **Glass Developments, Ltd.** The instrument produces a picture on a cathode ray tube screen similar to a radiograph of the specimen, but does it more quickly and can penetrate up to 20-30 ft. of steel. Another item will show the production of aluminium spirit levels produced at the rate of 900 ft. an hour on new automatic machines.

Demonstrations of the maintenance of quality control at every stage in the manufacture of its conveyor belts and hose will be the principal feature of the stand of the **Goodyear Tyre & Rubber Company.** Each of the three main groups of products—conveyor belting, wrapped ply hose and braided hose—of the Wolverhampton factories of the company will be included in the demonstration. A series of transparencies automatically illuminated in succession will show the efficiency of Goodyear's high standard of quality control. Each panel will show a stage of manufacture, a close-up of the test applied at that particular stage, and some

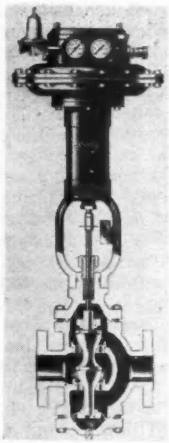
explanatory copy as to what is being done and why.

The main feature this year on the stand of **G. A. Harvey & Co. (London), Ltd.,** will be the Ellipsoidal Spun Head which was exhibited outside the Dome of Discovery at the Festival of Britain. This 'Rotarprest' head is 12 ft. 6 in. dia., 3 ft. 6 in. deep, and was designed for a pressure vessel to withstand 270 p.s.i. Spun from a 1¾ in. thick 14 per cent chrome 'Colclad' flat plate disc 15 ft. 10 in. dia., weighing 5¾ tons, this clad steel head, together with a display of cold rolled rings, is typical of the components Harvey's are able to produce for the fabrication of high pressure vessels and steel platework.

Developed to supply compressed air completely free from oil vapour or other impurities for such duties as food processing, raising liquids and for special applications in various scientific fields, is the novel DP6 electrically driven diaphragm type compressor which will be featured among the latest pneumatic equipment of **The Hymatic Engineering Co., Ltd.**

Two aspects of the multifarious activities of **Imperial Chemical Industries, Ltd.,** will be seen at Castle Bromwich. The Plastics Division—claimed to be the largest manufacturer of plastic materials in the British Empire—will have as the theme of its display the variety of properties that plastic materials possess and their wide range of uses. Examples of this variety will be illustrated by articles made of 'Alkathene', 'PVC', 'Perspex', nylon, 'Fluon' and moulding powders. In addition to general displays of sheet, strip, rod, extrusions, tubes, wire and fabricated metal sundries in copper, aluminium and their compounds, the Metals Division will feature the many applications of its wrought non-ferrous metals in building and transport. The work of its research department will also be illustrated with special reference to the new Creep Test Research Station at Witton.

Practical demonstrations of 'Jenolising' and of its aluminium keying solution which simultaneously provides a surface for paint adhesion, removes corrosive products and prevents their corrosion will be given during the run of the Fair on the stand of **Jenolite, Ltd.** Other products of the company which will be shown include paint strippers, rust remover and neutraliser, chemical scaler and soldering solution.



A typical Fisher diaphragm motor valve, with integral pilot for process control applications shown by the Fisher Governor Co., Ltd., associate company of Elliott Brothers (London), Ltd.

A working exhibit separating materials and elevating them to hoppers which will incorporate 'Locker-Traylor' vibrating equipment—feeder, screen, conveyor, dryer, elevator—coupled to a 'Rotex' screener, will be the chief attraction on the stand of **Thomas Locker & Company, Ltd.,** which has been associated with wire weaving since 1811. A sample of woven wire with 40,000 holes per sq. in. will be on view.

One of the most widely used of its industrial relays—the multi-contact LF type—will be among the range of relays, timers, pressure switches, flow indicators and level controllers exhibited by **Londex, Ltd.** One of these L.F. relays, which will operate either from D.C. or directly from A.C. mains, will be shown in a new style pressed steel case.

Few are more frequently faced with the need to reach work at ceiling level or high up on walls than maintenance engineers. Access to such places, hitherto often necessitating the erection of timber towers, trestles, cradles or scaffolding, is now greatly simplified by the 'Beanstalk' mobile rising platform. This aptly named equipment will be seen on the stand of its manufacturers, the Mechanical Developments Division of **William Moss & Sons, Ltd.**

A new refractory, Morgan M.R.1, which is rigid at a temperature of 1,600° C., will be the central feature of the refractories section stand of **The Morgan Crucible Company, Ltd.** Other new items displayed by the

company will include a new range of Salamander 'Suprex' crucibles designed for operations in specially arduous conditions; and the Megistor resistor recently developed and introduced especially for use in the very small current circuits of radiation detection and monitoring equipment, with a resistance range of between 100 and 1,000,000 megohms.

Barrier preparations for the protection of the skin against all classes of irritant materials used in industry will be shown by **Rozalex, Ltd.,** together with the Rex Dispenser, an appliance developed by the company to provide an economical and uncontaminated supply of Rozalex barrier preparation.

Plant specially designed to resist corrosion in all chemical industries will be shown by **Nordac, Ltd.** The firm was founded by Mr. Norman Swindin to continue and develop the researches which he carried out for the late Chemical Metallurgical Corporation (since incorporated in the I.C.I.). He designed and constructed a plant for the treatment of complex sulphide ores with brine containing 10 per cent hydrochloric acid at a temperature of 100° C. and found that the only material resistant to this solution was rubber. Since that time great strides have been made in application of rubber linings to all kinds of tanks, vats and vessels on site. Use of rubber brought into being a new type of chemical engineering. Although rubber was quite resistant to hydrochloric acid it could not be used for heat transfer plant, and it was then necessary to develop a method of heating an acid solution. Submerged combustion was therefore applied: it enables gas and oil to be burned in direct contact with the liquid in the simplest manner. The Swindin Submerged Burner to be shown is now in use for the concentration of weak sulphuric acid and especially for recovery of spent pickle in the steel and titanium industries.

The first acid recovery plant has been erected and is now working successfully at the works of the Lancashire & Corby Steel Manufacturing Co., Ltd. It is possible to operate submerged combustion with oil and gases from blast furnaces with a calorific value of 97 B.Th.U. per cu. ft. or unstripped cracker gases from the petroleum industries with a calorific value of 1,500 B.Th.U. per cu. ft. Use has also been made of the fluidised airlift for removing the deposited salts from a saturated solution of ferrous sulphate in 50 per cent boiling sulphuric acid. Plant also embodies a pre-evaporator in which heat in the products of combustion and steam from the submerged burner is used a second time as in double effect evaporation. Thus sulphuric acid concentration can now second time as in double effect evaporation. of 1-3.

Largest scope for the Swindin submerged combustion plant is generally associated with the iron and steel trade where the burner is used for heating of pickle baths containing sulphuric acid; also for recovery of sulphuric acid.

Plant Engineers' Education

DETAILS of the education scheme outlined at its recent Press conference in London (THE CHEMICAL AGE, **66**, 446), have now been published by the Institution of Incorporated Plant Engineers.

At present membership is by scrutiny of practical qualifications or by thesis, but after 1956 all candidates for Associate Membership, unless exempted by certain qualifications, will have to qualify by examination.

The examination will be divided into two sections. Section A will cover mathematics, applied mechanics, principles of electricity, applied heat, workshop technology, engineering drawing. Holders of an Ordinary National Certificate in either mechanical or electrical engineering will be granted exemption on a 'subject for subject' basis and from the engineering drawing.

Papers in Section B will deal with the theory and practice of: electrical energy, generation and distribution; mechanical energy generation; mechanical power generation. English and précis writing will be included in this section, but an equivalent exempting examination may be taken beforehand.

The syllabus includes steam raising plant; compressors and compressed air plant; pumping and hydraulic plant and refrigeration plant. It is emphasised that the syllabus should be treated from the viewpoint of the plant user seeking efficiency under running conditions and NOT from that of the designer and manufacturer.

Reference to statutory safety regulations and maintenance control will be made throughout the course.

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Metallurgical Section

Non-Ferrous Metals Research

Review of Progress in 1951

THE valuable co-operation of its members in carrying out experimental work was emphasised by the chairman of the council, Lieut.-Col. the Hon. R. M. Preston, D.S.O., in his statement at the 32nd annual general meeting of the British Non-Ferrous Metals Research Association held in London on 22 April.

Research carried out by the association was rarely discussed at the annual general meeting, continued the chairman, presumably because it was considered too technical. Nevertheless, the association was a technical body, and although the full annual report had been circulated, he felt that attention should firstly be drawn to its investigations.

An extension of its normal activities had been the work carried out on alternative processes for the recovery of both copper and sulphur from copper ores. This had been begun with the main object of recovering sulphur in an elementary state from the pyritic copper ores of Northern Rhodesia, but had since grown rather in scope and interest from the point of view of copper production.

Metal Finishing Researches

Referring to metal finishing researches, the chairman said that the association's position as the only co-operative research organisation in this field had led to rapid expansion of work for this industry. Last year, to meet this situation, the council accepted the Research Board's recommendation for the appointment of a new industry committee dealing with chemical and electrochemical processes. So far this committee had been concerned with electroplating and allied operations such as electropolishing, and a strong committee had been created from all sections of the industry interested in operations of this type, including representatives of the two non-ferrous basis metals mainly used in this operation, namely, copper and aluminium alloys.

One last and quite different point worthy of attention in discussing the research programme was spectrographic analysis. The practical value of the spectrographic method had been greatly increased by the application in America of direct recording equipment such as the production control quantometer. This instrument, originally devised for steel and aluminium alloys, was now used by a number of American firms and, in this country, by at least one member of the association.

Extension of Use

The possibility of extending the use of such equipment had obvious interest and the association has been fortunate in securing, mainly through E.C.A. funds, a prototype instrument designed in co-operation with our own staff for the analysis of copper and copper alloys. The copper producers had generously made special contributions towards the balance of the cost that had fallen on the association, and there was every hope that the development of this instrument would put in the hands of the copper industry a tool for production control which had already proved of value in speed and economy of manpower in the aluminium industry.

Incidentally, the association reaped the great advantage of having this instrument available in the laboratory where its use greatly facilitated the examination of variables which were suspected to affect the accuracy and reproducibility of the spectographic method.

Membership of the association had risen during the year from 495 to 550 and the Liaison Department had been strengthened by some increase in staff to meet the growing demands made on it.

Costs of all kinds, including salaries and wages, were constantly rising, and the income was not keeping pace with costs. Members were well aware of all this, and

practically all of them had increased their subscriptions during recent years, many of them substantially. Much, however, still remained to be done, especially bearing in mind that the terms of the Government Grant negotiated recently with the DSIR were considerably more onerous than they were for the previous quinquennium. Shortly, in order to earn £34,000 grant—the amount received last year—it would be necessary to increase the association's industrial grant-earning income by £6,000 this year and in 1953, and by £15,000 in 1954.

Research Progress

Full details of the progress of the association's research work during 1951 are reviewed in the annual report, which also gives a list of researches, confidential reports available to members, published reports, technical memoranda, and translations.

The various research committees and their members are set out, while lists are also given of the officers and council, members and subscribers and the staff.

Speaking at the annual luncheon of the British Non-Ferrous Metals Research Association held in conjunction with its annual general meeting, Lord Woolton, the Lord President of the Council, appealed for a sharing of knowledge among industrialists and for competition in the imaginative and courageous application of it. Britain had the craftsmanship, the scientific knowledge, and the skill in management available and it was up to industry to take full advantage of them.

Working Together

A wider application of scientific processes and methods could help industry to achieve its purpose, declared the Lord President, who also applauded the value of research and the co-operation in research of the man at the bench with the man in the laboratory.

Non-ferrous metals, he continued, were widely distributed among the lands of the Commonwealth.

Those who were concerned with these metals had, by their fuller use, the chance of increasing the prosperity of the areas in which they were found, of helping Empire development and, by their proper and economic application, of stimulating the engineering trades in giving birth to new processes in the use of these metals and in the preservation of machinery.

As Lord President of the Council, he had responsibility for the civil scientific work that came under the Government's patronage, and the Government would do its best to help industry in this respect. While the proper place for the encouragement of fundamental research was in the universities of the country, the application of it was best done not in Government laboratories, but where industrialists and scientists could work together, and the research association was a very British approach to this subject. It was run by the industry for the industry, the State supporting it with most generous grants.

An exhibition demonstrating the results of some of the association's more recent researches was held in connection with the luncheon and meeting.

New Titanium Process

A NEW method of removing magnesium and magnesium chloride from titanium is disclosed in a technical report released today by the U.S. Bureau of Mines. In the past, magnesium and magnesium chloride have been extracted from raw titanium by leaching and grinding methods, but metallurgists of the Bureau of Mines pilot plant at Boulder City, Nev., obtained far superior results with a vacuum distillation process, according to the report of the Bureau.

The authors, M. A. Cook and F. S. Wartman, metallurgists of the Electro-metallurgical Branch of the Bureau of Mines, describe the process, the equipment used, loading, heating, and unloading, and point out that the batch process is a feasible commercial operation, but that there are certain disadvantages such as the necessity of using special steels, and the difficulty in adapting the system to continuous operation.

Operating data are given, comparing ten 24- to 30-hour heats with ten 48-hour heats and, finally, power and labour requirements are discussed. A free copy of their Report of Investigations 4837, 'Removal of Magnesium and Magnesium Chloride from Titanium Sponge by Vacuum Distillation,' may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa., U.S.A.

Chemicals Aid in Combating Corrosion

Time & Labour Saved in Reconditioning Vehicles

RECLAMATION of vehicles, which has been developed to augment the re-armament programme, was at first considerably handicapped by derusting problems. The small vats used and hand methods employed produced only moderate results while output was limited by the amount of labour available and costs were high.

Installation of larger tanks for paint removal gave slight improvement in production, but the removal of rust and scale remained the predominant difficulty. A further complication was that parts, when derusted, corroded again unless painted immediately.

It was then decided to turn to chemicals, and a wide range of derusting processes were tried out by practical tests. As a result Jenolite was eventually selected, for it was found that this rust remover and neutraliser removed all rust on surfaces and in crevices previously considered inaccessible; prevented further rusting; and gave a sound key for paint in one dipping operation.

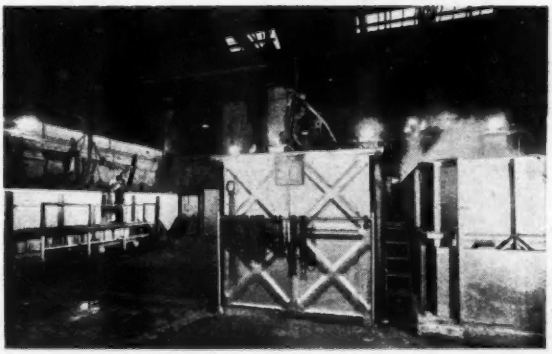
This led to the elimination of all hand and mechanised methods.

Vehicles in exceptionally rough condition are first stripped; then the chassis, cab and all components are put through Jenolite process tanks in the following order:

Degreaser and paint stripper; water rinser by pressure sprays; scale remover; water rinsed as before.

Degreaser and paint stripper P.S. 5 is used at the ratio of one lb. to a gallon of water at 90°C. The mild steel tank containing this measures 24 ft. by 5 ft. 6 in. by 6 ft., and has a working capacity of approximately 3,000 gallons. The efficiency of the

One man removing the cab of a lorry from the tank derusted, protected against further corrosion and keyed for paint after only 20 to 30 minutes immersion. Previously it took eight men to remove the rust from one vehicle



Three types of Jenolite tanks used in the reclamation of vehicles. Two of these, one stainless steel and the other mild steel, are gas heated; the third, which is rubber lined, is kept cold. Each of these tanks has a working capacity of 7,500 gallons

solution is maintained by periodical topping-up. Grease and paint sludge which accumulate at the bottom of the tank are kept in check by complete tank clean-outs three times a year. The period of immersion is variable, according to the type, quantity and condition of paint to be removed.

The solution it contains is Jenolite H.S.R., a heavy scale remover used in proportions varying according to the density of scale to be removed. The usual proportion for heavy scale is two parts water to one H.S.R./C. This completely frees the components of scale in times varying from five to 20 minutes.

All components are next treated in Jenolite R.R.N. 1. This tank is larger than that used for degreasing, having a working capacity of approximately 5,000 gallons. The concentrated Jenolite is diluted to meet specific requirements and heated to 70°C.

When the metal emerges after 10 to 15 minutes immersion it is completely freed of rust, proved against further corrosion, and keyed for paint.

The number of components being treated in this way adds up to varying totals of from 20 to 70 complete vehicles a week (depending on size of contractors' plant and premises), as opposed to a fraction of that output by previous methods plus many times the labour.

Parts are then conveyed to various departments for inspection and repair, if necessary. This may take up to six weeks, during which time all the parts remain free from rust.

On passing final inspection, all metal parts —except engines—are given a final treatment in Jenolite R.R.N. 1.

U.S. Metallurgy Courses

NEW developments in two phases of metallurgy will be reviewed in special courses on surface reactions in flotation and on the chemistry and mechanics of moulding materials, to be given at the Massachusetts Institute of Technology during the summer of 1952.

The first course, to be held from 9-13 June, will interpret and co-ordinate recent data on adsorption as a thermodynamic process, the electrical double layer, the effect of crystal structure on the nature of solid surfaces, classification of minerals by flotability, properties of common collectors in aqueous solutions, applications of the ion exchange process, and the *p*H variable.

The other course on the chemistry and mechanics of moulding materials will be given from 1-6 September and will attempt to provide a fundamental appreciation of refractories and binders of both current and potential use in the foundry industry. Both practical and technical aspects of the subject will be developed. Topics will include the origin, types, location, mining, and separation of sands, clays, and refractories for foundry uses; physical properties and characteristics measured; chemical compositions of materials; bonding action of binders; and physico-chemical characteristics of clays.

The technical instruction will also include a treatment of flow-ability as a physical property of sands, and a demonstration of mechanical packing characteristics under various conditions.

Alloy Steel Supplies

ARRANGEMENTS for economising in the use of nickel and molybdenum in alloy steel, and for increasing its production, have been worked out by the Ministry of Supply with the alloy steel makers and the main consumers, it was announced on 13 April.

Already in operation to some extent, the arrangements will become fully effective on 2 June.

The general effect will be to divide alloy steels containing nickel or molybdenum into three groups, as follows:—

Those containing little nickel or molybdenum which may be supplied to any consumer of alloy steel up to the quantity for which he holds an authorisation; those, somewhat richer in these elements, which may only be supplied for particular purposes; and those, richer still, the supply of which is prohibited except as specifically approved.

Certain special types of alloy steels, such as tool steels and those designed to resist heat and corrosion, are not affected.

Jamaican Oil Possibility

A preliminary aerial survey of oil possibilities throughout the island of Jamaica is now being carried out on behalf of the Base Metals Mining Corporation Limited of Toronto, Canada, who have been granted a concession to prospect for oil and gas in Jamaica.

The Welding of Monel Sheet

Problems Overcome by Spot Welder

EFFICIENT differentiation between steam, air and condensate in the steam traps manufactured by C. A. Dunham Co. Ltd., of Merton, is achieved by means of an expansion type thermostatic element which has a diaphragm made up of two pressings from .006 in. monel sheet, jointed with a gas-tight seal.

Jointing Attempts Unsuccessful

Attempts to join the pressings by resistance welding were at first unsuccessful and consideration was given to the use of heavier gauge material which would be easier to weld. Some success was obtained with .008 in. monel sheet, but trouble with electrodes which 'mushroomed' or built up with monel, and had therefore to be frequently repointed, ruled out the use of resistance welding in production. The joint was therefore made by soldering and this involved tinning all surfaces and folding one flange over the other.

Successful welding of the joint in production has now been made possible by the use of a 4-kVA electronically controlled spot welder manufactured by The General Electric Company Ltd., and designed in their research laboratories for their own use in welding very thin wires and sheets, for which work suitable equipment was not available on the market.

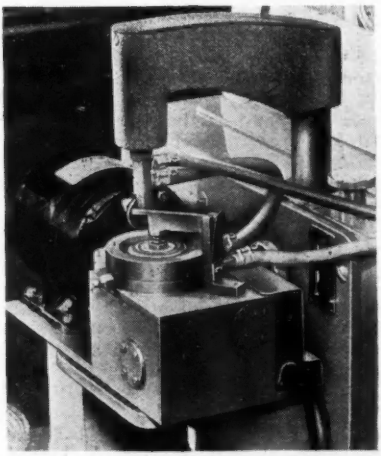
Formation of Lower Electrode

The diaphragm of the steam trap is assembled and placed in a jig which forms the lower electrode, the jig being made of tellurium copper because of its high conductivity and machinability. The top electrode consists of a chromium copper disc, freely rotatable. Both electrodes are water cooled. The jig, designed to take two sizes of diaphragms, is rotated by an electric motor at a speed selected to give overlapping of the spot welds so that a continuous seam results. A 2 in. diaphragm can be welded in 45 secs. with 160 spot welds. The complete operation including cleaning the pressings by wiping, assembling and welding is carried out in production at the rate of 45 diaphragms per hour. At least 500 diaphragms can be welded without changing or dressing the disc electrode.

The spot welder, which has made possible the welding of many non-ferrous metals not normally considered suitable for resistance welding, supplies current in the form of heavy pulses of from one to six cycles duration, accurately timed by the electronic control circuit. A synchronising circuit ensures that the weld always starts at the same point in a supply cycle. The top electrode is carried in a low-inertia holder to give the quick follow-up necessitated by the rapid collapse of the metal being welded.

Features of the machine include fully variable controls of current and mechanical pressure—the latter between 5 and 50 lb. with graduated scales so that settings may be recorded. The weld switch operates only when the pre-set pressure has been applied, and the completion of a weld is shown by a red signal lamp.

The rating of the welder (4-kVA) is in terms of the BEAMA formula, that is, 50 per cent of the short circuit kVA.



[Courtesy the General Electric Co., Ltd.

The 4-kVA electronically controlled spot welder used for the welding of monel sheet

Value of Tin Alloys

Tin Research Institute's Report for 1951

ADVANTAGE of its new laboratory extensions, which were opened by the Duke of Gloucester last May, was taken in 1951 by the Tin Research Institute, Greenford, Middlesex, to begin several lines of investigation for which facilities were not previously available.

Chief interest, however, according to the institute's report for 1951, was centred on pilot stage work on electrodeposited tin-alloy coatings. There were a large number of requests for white metal deposits as an alternative to nickel and both speculum plate and tin-zinc had been adopted for that purpose.

Shortage of other metals had given rise to a number of consultations and specialised tin alloys had been devised as substitutes, which, although more expensive, had enabled certain trades to keep in production.

The process of developing a satisfactory commercial process for the tin-nickel alloy plating invented in 1950 had been continued and pilot-scale plant had been in continuous operation in the laboratories. A large commercial installation of about 2,000 gallons capacity had also been in operation in the Birmingham area during the latter part of the period under review.

New Hard Pewter

A new hard pewter, a modification of the standard alloy which was as easy to work, but by a simple heat treatment could be made twice as hard, had been introduced and had been well received in the U.K. and on the European continent.

Problems of casting bronze bars longer than could be done in the usual moulds (about two feet), were being investigated. So far this had been solved only in America with the use of complex and expensive plant suitable for runs of considerable length on one size and quality of product. The aim of the institute was a more simple and flexible plant which would be suitable to European manufacturers.

During the year the new Underwood bearing testing machine had been actively employed. A basis for comparison had been established by runs on standard bearing alloys. Exploratory tests made on the new aluminium-tin alloys showed that they had fatigue resistance superior to babbitt.

The chemical analysis section had been engaged primarily on the analysis of samples arising from researches in other sections, and in the past year had been particularly engaged by the electrochemical section in connection with researches as well as technical service.

Study of the chemical analysis of tin ingots was completed and the resulting publication had been much in demand. Photometric methods were now being examined and a method of determining copper in tin alloys had been published. Such work would eventually make possible an exhaustive publication on tin and tin-alloy analysis.

There had been no change in the senior staff at Greenford or at the institute's overseas offices, but there had been several changes among the younger scientists, a number of whom had left to accept more highly paid posts with industrial concerns. This inevitable interchange at least strengthened the ties with tin consumers, while it also provided an opportunity to recruit graduates with the most recent academic background.

Among the extra-mural research considerable progress had been made at the University of Utrecht under Dr. van der Kerk on the preparation and properties of new organo-tin compounds. New methods of preparation and new compounds had been devised with potentially interesting properties. Extensive trials of fungicides, insecticides, and so on, had been put in hand.

In order to strengthen the council's technical development activities overseas and to enable it to consolidate its research staff so that promising lines of research might be carried forward more rapidly, an appeal for a 50 per cent increase in subscriptions had been proposed.

Spanish Use Bagasse

The Motril region of South Spain produces about 200,000 tons of sugar cane a year. The waste fibres (bagasse) of the cane after refining amount to about 50,000 tons and have hitherto been used as fuel in the refineries. Now, however, a cellulose factory is to be built to use the bagasse as its raw material, and it is expected to produce 15,000 tons of cellulose annually.

Thermal Conductivity Co-Efficients

New French Method of Determination in Metals

SEVERAL methods have been proposed and used for determining the coefficient of heat conductivity in metals—obviously a very important factor in many ways. An interesting description of the method and apparatus used by the Société des Forges et Aciéries du Creusot has been given recently by Edmond Rousseau (*Chim. et Ind.* 1952, **67** (2), 242-248).

A cylindrical bar is heated at one end and cooled at the other by a stream of water of known volume and flow. The difference in temperature between inflowing and outflowing water gives the number of g/cal. conveyed per second. Knowing also the difference in temperature between two points of known distance apart and the sectional area of bar, the coefficient of heat conductivity can be calculated for section of 1 sq. cm., considered for a difference of 1° C. between two points 1 cm. apart in a direction perpendicular to the section taken:—

$$\lambda = \frac{\text{N(cal-g.)} \times \text{L(cm.)}}{\text{S(cm}^2\text{)} \times (\theta_1 - \theta_2)}$$

Stray or lateral losses are avoided with the help of a protective tube.

The apparatus consists of three principal parts: (*a*) a small electric furnace with a central tube, which engages one end of the test bar, and with independent temperature control; (*b*) an insulating cylindrical jacket, with mantle or sleeve in two parts, and a refractory tube wound with nichrome wire, electrically heated—six independent circuits in all—with suitable temperature control, to prevent radial losses from the test-piece; (*c*) a water circulation calorimeter, screwing into the other end of the test-bar. This includes an external sheath or tube of stainless steel; a threaded copper socket in which the test-bar is screwed; a flat copper spiral inside, between the socket and the sheath, to direct water circulation around the socket; two copper tubes through the calorimeter to take temperature-reading couples along the whole length of bar; and copper tubes for water circulation.

The cylindrical test-bar is about 500 mm. long and of 6 sq. cm. section. The screwed end, about 60 mm. long, is 0.5-1 mm. thicker to take the thread. By means of spiral (generated) slots and special fibrocement the couple is contacted (or as closely as possible) with the test-bar. In the case of metals easily machined the temperature

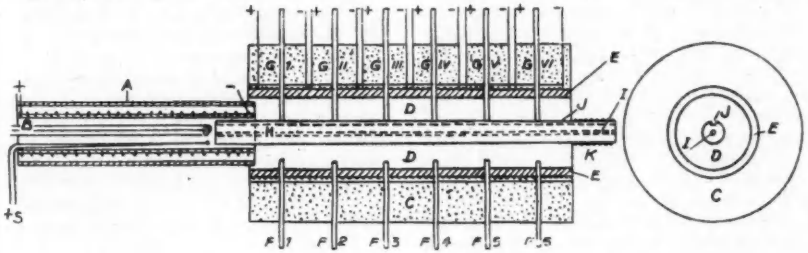


Fig. 1.—A. Electric furnace; B. Temperature control; C. Protective or insulating jacket; D. Asbestos tamping or pack; E. Electrically heated jacket or tube; F. (1-6). Couples for same; G. (1-6). Couples for test-bar; H. Test-bar; I. Axial hole in test-bar; J. Slot in test-bar; K. Screwed end to take calorimeter; L. Water-inlet tube for calorimeter; M. Water-outlet tube; N. Thermometer in tenths; O. Flat spring for water circulation; P. Tubes for taking exploratory couple; Q. Spiral copper tube; R. Threaded socket; S. Control couple for heating furnace; T. Recording potentiometer; U. Graduated bar; V. Portable potentiometer; W. Calorimeter; Y. Rheostats; Z. Recharge (reload protection tube). The caption references actually include several not shown in this fig., but some may be seen in fig. 1 of original p. 243)

D

can be read with the aid of a hole drilled in the end (I). For metals that are more difficult the sample can be cast, and slotting done with a fine emery wheel—in some cases the metal may be plated with copper in which the thread is cut. In one operation, conductivity coefficient curves may be obtained, especially for ferrous and some refractory alloys, over temperature ranges of 150-500° or 200-1,000°C.

For correct results in reading the temperatures, it is, of course, essential that the heat flux along the bar should be wholly absorbed by the circulation water in the calorimeter. To avoid loss the protecting sheath should have the same temperature on the same plane perpendicular to the bar's longitudinal axis. These temperatures are read with suitable couples (Pt, Pt-Rh, or others) as shown in Fig. 1 (F1 to F6 and G1-G6). Repetition curves practically the same as the others are obtained with a silica tube placed 20 mm. from the test bar, showing the reciprocal effect of heating circuits when close together. All couples are connected by means of switches to the same recording potentiometer, thus eliminating errors due to readings taken from different instruments. Since temperature differences are usually of the order of 50-100° C., possible relative errors are almost insignificant.

Use of Graduated Rod

Distances between points of temperature measurement are determined by means of a graduated (in mm.) rod disposed in the calorimeter tubes extension—through which the explorative couple is introduced and connected with another potentiometer of portable type.

In using the apparatus it is placed on a table or bench in sloping position (20-25° to horizontal), the heating end being higher, in order to avoid flow of heat by convection along the test bar to the calorimeter. It might be even better to have it upright, but this would then be somewhat complicated and inconvenient. The circulation water of the calorimeter should be placed beforehand in a 100-litre container in the same room for a time, so that it can attain the correct room temperature and deposit any matter in suspension.

When the furnace has reached the desired temperature the control is brought into action, current is passed through the heating circuits of the jacket, the calorimeter and thermometers inserted, and water flow adjusted. By means of rheostats the temperatures in the protective jacket couples are kept as near the same as those of the couples contacting the test-bar as possible. When the furnace temperature is stable, and those of the two sets of couples are equal, and when the temperature difference between the two thermometers remains fairly constant for about half an hour, equilibrium may be assumed, and the final stages undertaken.

The temperature of the in- and out-flow water of the calorimeter is read, also rate-of-flow of a given amount of water, giving cal/g. discharge per second. The exploratory couple temperatures are read at various points (20-50 mm.) as required. These various readings enable distribution of temperature as a function of test-bar length to be plotted. Heat conductivity coefficients are usually expressed in CGS. Knowing on the one hand the distribution of temperature along the bar, and, on the other the cal/g. flowing per second (CGS), coefficients may be obtained in two ways: (*a*) directly, from temperatures and distances; (*b*) by using a large-scale distribution curve. The first is preferred in this case; and as the readings near the ends of the bar, owing to the effect of the furnace at one end and of the calorimeter water at the other, are not reliable, it is generally best to extrapolate the coefficient curve obtained to within 20-25 mm. of the furnace or calorimeter.

The following example calculation is given: Time required for flow of 500 c.c. water—152 seconds; rate 3.294 g./sec.; temperature of inflow water (calorimeter)—22°30, and of outflow—26°47; difference—4°17; cal/g/sec, $N = 3.294 \times 4.17 = 13.694$; temps. read at two points of test-bar 2.5 cm. apart—542° and 480°; mean temperature—511°; difference—62°; sectional area of bar —6 cm². Coefficient $= \frac{13.694 \times 2.5}{6 \times 62 \times 100} = 0.092$.

For this particular metal, therefore, the coefficient is 0.092 for a temperature between 480° and 582°C. or, say, a mean temperature of 511°C.

The author discusses various precautions to be taken, and the relative exactness and reliability of the method. Some further practical tests are also described.

The Chemist's Bookshelf

THE TERPENES. Vol. III. (*2nd* Edition). The Sesquiterpenes, Diterpenes, and their Derivatives. By Sir John Simonsen and D. H. R. Barton, with Addenda to Vols. I and II by Sir John Simonsen and and L. N. Owen. Cambridge University Press, London. 1952. Pp. XI + 579. 50s.

There is great current interest in the terpenes: in at least one university, lectures on this topic have been reintroduced after being unfashionable for several years. The standard work on the degradations, synthesis and structural proofs of the less complex terpenes is 'Simonsen', first published in two volumes in 1931-1932. Vols. I and II of the second edition came out in 1947-1948, and Vol. III now makes a timely appearance.

The section on sesquiterpenes has been rewritten, and is more than doubled in size in the new edition. A masterly survey of santonin chemistry (63 pages) is included in a completely new chapter on sesquiterpene lactones. A section of diterpenes (152 pages) has been added, and is the best available review of this complex subject. An addendum (60 pages) brings up to date Vols. I and II of the second edition. It is surprising to see how many advances have been made during the last six years in the chemistry of the simpler terpenes; for example, syntheses of citral, α- and γ-terpineol, phellandral, and piperitone are discussed, and the present position in the *iso*propenyl-*iso*propylidene controversy is summarised.

Literature coverage is practically complete to the end of 1949; there are numerous references to 1950 publications and to work in progress. The liberal provision of clearly drawn formulae will be appreciated; the bent double bond on p. 16 (X) is perhaps unfortunate, and occasionally formulae in a sequence are not of uniform size (e.g., pages 145, 216, 217). The book seems remarkably free from minor errors and has the attractive format of the previous volumes.

Organic chemists everywhere will enthusiastically welcome this addition to the literature; many will hope that it will be possible for the authors to deal with the triterpenes in a future volume.—W. WILSON

CIVIL ENGINEERING PLANT AND METHODS. By R. Hammond. 1952. London, Ernest Benn, Ltd. Pp. x + 229. 25s.

The author, Mr. Rolt Hammond, A.C.G.I., A.M.I.C.E., has had a most varied experience in different branches of engineering since serving his apprenticeship some 25 years ago. He has held responsible posts on the construction of an Argentine railway, an extension to the London 'Underground', and a hydro-electric scheme in Spain. For two years he was assistant secretary to the Institute of Fuel and at the outbreak of war was editor of the *British Engineer's Export Journal* (now *British Engineering*). During the war he served with the Admiralty, Ministry of Works, Ministry of Fuel and Power and his work ranged from open-cast mining to tank design. He is, therefore, well-qualified to write on the subject of this book, and it is not surprising to find that Mr. Rolt deals with a wide range of plant, from the very small to the very large. He also covers a good selection of the many basic operations.

Most of the proved constructional methods are summed-up for easier reference and there is a useful index. Chapters are devoted to Excavating Plant, Piling and Foundation Plant and Methods, Cranes and Lifting Appliances, Plant for Dock and Harbour Construction, Tunnelling Methods and Equipment, Unit Construction in Civil Engineering, Road-Making Machinery and the Organisation of Civil Engineering. There are 41 exceptionally clear diagrams and 14 good photographs. A list of references is given at the end of each chapter.

Publications & Announcements

GAMMA-RAY radiography is now firmly established in industry as a non-destructive method of inspecting castings, welded assemblies and other engineering components. Johnson, Matthey & Co., Ltd., have recently reissued their Data Sheet 2783, which is available free on request to the firm, 73/83 Hatton Garden, London, E.C.1. The sheet gives information upon an improved portable carrier, designed for use with sources up to a value of 500 millicuries of cobalt^{60} or the equivalent, and a time-controlled unit that enables exposures of predetermined duration to be made in a cleared room.

* * *

VISIBLE-FLOW pipe lines and their use in industry is the subject of an illustrated booklet available from James A. Jobling & Co., Wear Glass Works, Sunderland. This describes the many uses to which 'Pyrex' brand glass pipe lines are put in the milk, mineral water, brewing, bottling, food, essential oil, wine, fine and heavy chemical, pharmaceutical, gas, tanning, bleaching, dyeing, textile, and petroleum industries. These pipe lines, with their low expansion coefficient, standard units and ease of assembly and dismantling are in use in a multitude of processes throughout industry, and combine to a great extent all the most desirable features in the conveyance of liquids through pipe lines. The booklet is attractively produced, giving photographs of actual installations of the company's products.

* * *

VACUUM tray driers (No. 105) is the subject of a leaflet (No. D52) published by Apex Construction Limited, of 15 Soho Square, London, W.1. These driers, say the company, incorporate five new features of interest to the chemical, pharmaceutical and allied industries. They are lighter and more compact than the older C.I. type. They are jacketted top and bottom to prevent condensation and to make all shelves usable, the bottom jacket acting as a shelf. Staggered sight glasses are provided on all models. Stainless steel clad shelves and jackets are available with metal-sprayed body interiors, and there are five standard body sizes only, with standard shelves fitted into these according to working area and shelf spacing required. Very short delivery is possible.

AN INTERESTING number of *New Biology*, a twice-yearly Penguin, has made its appearance this month. It contains authoritative articles on biological aspects of life in much the same way as *Science News* covers the wider scientific field. Subjects of some of the articles in this issue include: 'Variation' by J. B. S. Haldane; 'The Mode of Action of Copper Fungicides' by R. L. Wain; a lucid explanation of biochemistry as applied to the study of bacteria, by J. Perret; the new knowledge of the action of the heart in the frog, by G. E. H. Foxon; two contributions to the study of life's origins—'Geochemical Aspects of the Origin of Complex Organic Molecules' by the late V. M. Goldschmidt, in which the author ventures that these molecules may have originated on the surfaces of early mineral crystals, and 'Vital Blarney', a critical review by N. W. Pirie of the recently published 'The Physical Basis of Life' by J. D. Bernal.

* * *

GALLENKAMP & Co., Limited have issued a leaflet describing two of their laboratory ovens and a laboratory vacuum oven. The first two are for general purpose use as drying ovens or sterilisers, and for laboratory or industrial processes requiring uniform temperature distribution and, in the second type, mechanical convection. Also published is a card giving details and specifications of two more general purpose ovens and various accessories.

* * *

A TYPE of 'isomantle' suitable for use in dangerous areas where the heaters need to be flameproof is described in a new leaflet from Isopad Limited, of 13-17 Rosemont Road, London, N.W.3, makers of isomantles in a variety of different sizes. This is the latest development of the company, and it has a heating circuit consisting of a metal clad mineral insulated heating element which terminates in flame-proof glands screwed into flame-proof terminal boxes which take a ¾ in. conduit. These mantles are claimed to be proof against spillage as well as flame, and to stand up extremely well to accidental rough handling. Two types are available, one for temperatures below 250° C., with copper-clad elements, and the other for temperatures up to 600° C. with stainless steel clad elements.

HOME

The Chemical Age at the BIF

For the convenience of its readers THE CHEMICAL AGE announces that the proprietors, Benn Brothers, Ltd., have been allotted two telephone numbers at their stands at the British Industries Fair in London and Birmingham. The numbers are as follows: Stand No. A.18 Olympia, RENown 5068 and Stand No. A.427 Castle Bromwich FAIR 213.

Handling Exhibition

Manufacturers and distributors of chemicals will find much to interest them at the Third Mechanical Handling Exhibition and Convention to be held at Olympia, London, 4-14 June. The exhibition, which will occupy about 250,000 sq. ft., will be the largest of its kind in the world. There will be nearly 200 exhibitors covering every type of mechanical aid.

Titanium Pigments off the Ration

British Titan Products Company, Limited, announce that from now onwards it will no longer be necessary to ration allocations of 'Kronos' titanium pigments, and orders for May will, it is hoped, be met in full. Should the resulting demand be in excess of the company's estimates, it may be necessary, they say, to reintroduce some measures of control later. This, however, is said to be unlikely in view of the increased manufacturing capacity now gradually coming into production.

SCI Joint Conference

Fluidisation Technology will be the subject of a joint conference to be held by the Chemical Engineering Group of the SCI, the Koninklijk Instituut van Ingenieurs, and the Netherlands Chemical Society (Chemical Engineering Group) on 12-13 June this year. The conference will take place at the Connaught Rooms, Queen Street, Kingsway, Strand, London, W.C.2. Among papers to be presented are 'Problems of Plant Design for Fluidised Processes', by S. A. Gregory; 'Some Fundamental Characteristics of the Fluidised State', by C. van Heerden; 'An Experimental Study of the Mechanism of Fluidisation', by René Jottrand and others.

Fewer Fatal Accidents

The number of deaths from industrial accidents reported in February was 115, compared with revised figures of 130 in the previous month and 147 in February, 1951. Only two deaths were recorded in chemicals, oils, soaps, etc.

Changes in Control

Changes in export licensing control are made by a Board of Trade Order which came into operation on 30 April 1952. Licences are now required for all destinations for certain refractory materials and their manufactures, wire mesh mainly of nickel, certain forms of thorium and uranium, iron pyrites, some scientific apparatus, certain plasticisers, mixtures and preparations containing tungsten compounds, appliances for producing smoke for military purposes, and further abrasive manufactures.

Specified waxes, certain mica sheets and artificial silk waste, yarns and thread are now exempt from export licensing control.

Technical Liaison

Barbet Limited, 175 Piccadilly, London, W.1, have announced that they have concluded an agreement with R. S. Aries and Associates, 400 Madison Avenue, New York. This group of well-known American consulting engineers deals with a wide range of production projects in the chemical engineering field, from factory planning to final production schedules, and their experience and technique will be made available in this country through Barbet Limited.

Import Applications

The Board of Trade announce that applications to import during the second half of this year goods subject to the 'November' or to the 'Budget' import cuts will receive consideration if received up to Monday next, May 5. The original closing dates were 17 April ('Budget cuts') and 1 May ('November cuts'). In making this concession the Board stress that it will be quite impossible to consider any application received after this date, as the work of allocating licences will then be in progress.

PERSONAL

The Harrison Preston Eddy award, an American award for research work on sewage and industrial waste was presented on 15 April to DR. S. H. JENKINS, chief chemist to the Birmingham Drainage Board, at a joint meeting of the Institute of Sewage Purification and the Institute of water Engineers. Dr. Jenkins wrote the paper which earned the award in collaboration with PETER W. DAWSON, biologist of the Board.

At its recent annual general meeting in London, the British Compressed Air Society elected MR. J. A. HUNT, M.B.E., general manager of The Hymatic Engineering Co., Ltd., as president for the coming year. MR. H. G. HARWOOD, a director of Hugh Wood & Co., Ltd., was elected vice-president. The main objects of the Society, which was founded in 1930, are to promote and safeguard the interests of the compressed air industry of Great Britain and Northern Ireland and to consider all matters affecting it apart from the relationship between employers and employees and the question of pricing arrangements. Membership or Associate Membership is open to all manufacturers in the U.K. of air and gas compressors, pneumatic tools, spray equipment, pneumatic control devices and other compressed air apparatus.

MAJOR F. A. FREETH, O.B.E., D.Sc., F.R.S., has joined the board of Sondes Place Research Institute, Dorking, it is announced.

DR. THOMAS J. MORRISON, head of the Chemistry Department, Brighton Technical College, has been appointed to the newly created position of head of the Chemistry Department, Dundee Technical College. Trained in Dundee and latterly with I.C.I. he was at Dundee Training College until 1937.

Obituary

We announce with regret the sudden death, on 16 April of MR. JOHN D. GEORGE, only son of the late Mr. W. J. George, one of the founders of W. & J. George & Becker, Ltd. Mr. John George, who was a director of the Company, was 25 years of age.

Microchemical Apparatus

Four New British Standards

FOUR new British Standards have recently been published in the microchemical field . These are:—

Part A2:1952, nitrogen combustion train (Micro-Dumas).

Part A3:1952, halogens and sulphur combustion train (Pregl).

Part D1:1952, burettes with pressure-filling device and automatic zero.

Part H1:1952, weighing vessels for microchemical analysis.

These British Standards are further parts of B.S.1428, publication of which began in 1950. The project aims at specifying the standard items of apparatus required in microchemical work, but there is no intention of hindering future improvements in technique or materials. The scope covered is as follows:—

A. Combustion trains for the determination of elements.
B. Apparatus for the determination of elements by other than combustion methods.
C. Apparatus for the determination of organic groups.
D. Volumetric apparatus.

Parts A2 and A3 each specify the components required, with dimensioned drawings, and also include a general assembly drawing of the whole train. Where appropriate, alternative components are specified which may prove more suitable for some purposes.

Part D1 specifies special burettes of 5, 10 and 25 ml. capacity. It gives full dimensions but, in accordance with current practice in British Standards for Volumetric glassware, lists only the essential ones as mandatory, when the B.S. is applied, the remainder being given for the guidance of manufacturers. It includes tolerances for capacity and delivery time, and requirements for material, construction and graduation. It also constitutes Part 3 of B.S.846 'Burettes and bulb burettes' and is incorporated in the 1952 edition of that standard.

Part H1 specifies five types of glass vessel: a weighing bottle and a weighing pig with ground stopper, long-handled weighing tubes with and without ground caps, and a weighing tube with two ground stoppers. It gives details of construction, finish and maximum weights.

• OVERSEAS •

Pumping Ore to Refinery

Reduction of the time required to transform nickel ore into refined nickel has been achieved by the International Nickel Company of Canada by means of pipeline transportation. A 7½-mile pipeline has been constructed through which the bulk concentrate from 3,650,000 tons of nickel-copper ore is being pumped annually from the newly-built Creighton concentrator to the company's reduction plants at Copper Cliff. This pipeline artery is part of International Nickel's $130,000,000 programme of underground mine expansion.

Bahia Expansion

Construction has started on the expansion of Brazil's first modern refinery—completed in 1950 at Mataripe in the State of Bahia, Kellogg Pan American Corporation is supervising construction. The expansion will double the capacity of the present 2,500-barrel-per-day combination thermal refinery. It will also include catalytic polymerisation which will raise the overall octane rating of the finished gasoline, as well as facilities for the production of LPG (liquefied petroleum gas). The only pre-polymerisation treating step will be caustic washing to remove the small amount of sulphur remaining in the gaseous charge stock.

Brazilian Iron Ore Exports

The Annual Report for 1951 of the government-controlled Cia. Vale do Rio Dôce, S.A., of Brazil, which mines, transports and exports iron ore from the well-known Itabira deposits in Minas Gerais, shows that the company has continued to make excellent progress during the last year. The report states that 1,314,000 metric tons of iron ore were mined last year, compared with 732,000 in 1950. It is stated that the first objective of the development programme, envisaging ore exports at a rate of 1,500,000 tons per annum, should be attained in 1952. The second stage of the programme, which would increase such exports to 3,000,000 tons anuually, would, however, depend upon the expansion of the Company's mining and transport facilities at an estimated cost of Cruz.260,000,000 (£52,000,000) and the work could be completed in two years.

Tar Sands to be Developed

A project to develop the tar sands of the Athabaska river, Alberta, is being planned by 10 independent Canadian oil companies which have leased 250,000 acres in that area. A programme of core drilling to discover in what parts of the field the sands will yield most oil may be begun this spring. Fundamental problems in separating the oil from the sands were solved some time ago by scientists working under the auspices of the Federal and Alberta Governments. It is anticipated that a plant having a capacity of 20,000 barrels of oil a day may be constructed.

Norwegian Nickel Increase

Extensions have been carried out at the Falconbridge Nikkelverk plant at Kristiansand, S. Norway, which will enable the production of nickel to be increased to 14,000 tons a year. Norway's production of nickel last year was 11,080 tons.

Resume Production

The Sydvaranger iron ore mines at Kirkenes, North Norway, resumed production last month. Reconstruction after wartime destruction has cost £8,750,000. The mines are the largest in Norway and output now is at the rate of 1,000 tons a day, and in the course of this year it is intended to raise the annual production rate to 500,000 tons. Next year production will be at the annual rate of 1,000,000 tons. The whole of this year's production, states one of the mines' directors, has already been sold at satisfactory prices. The first shipments will take place at the beginning of May. The buyers are Great Britain, Western Germany, and Belgium.

MCA Meeting

The second semi-annual meeting and winter conference of the Manufacturing Chemists' Association, Inc., will be held on Tuesday, 25 November, at the Hotel Statler, New York City. The one-day meeting will be devoted to panel discussions of current problems facing the chemical industry and will be climaxed with a banquet featuring a prominent speaker.

Next Week's Events

MONDAY, 5 MAY

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Dr. E. F. G. Herington: 'Laboratory Fractionation,' preceded by annual general meeting.

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. Meeting for the reading of Original Papers.

Exeter: Washington Singer Laboratories, Prince of Wales Road, 5 p.m. Reading of Original Papers.

TUESDAY, 6 MAY

Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. C. M. Nicholls and A. S. White: 'Chemical Engineering and Atomic Energy.'

Institute of Metal Finishing

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. F. S. Duc will open a discussion on 'Bronze Undercoats as a Substitute for Nickel.'

Incorporated Plant Engineers

Manchester: Engineers' Club, Albert Square, 7.15 p.m. Open meeting; questions invited.

British Chemical and Dyestuffs Traders' Association

London: Savoy Hotel, W.C.2, 1 p.m. Annual luncheon.

WEDNESDAY, 7 MAY

Society of Public Analysts

London: Burlington House, Piccadilly, W.1, 7 p.m. Miss E. M. Chatt: 'A Routine Method for the Analysis of Table Jellies'; C. J. L. Baker: 'The Determination of Oxalates in Fresh Plant Material'; E. G. Brown and T. J. Hayes: 'The Determination of Small Quantities of Ammonium Di- or Tri-ethanolamine Alginate in Rayon-Finishing Solutions and on Rayon Yarn.'

THURSDAY, 8 MAY

Society of Chemical Industry

Edinburgh: Assembly Rooms, George Street, 3-Day joint conference of the Food and Agriculture Groups, in association with the Scottish Sections of the society on: 'The Quality of Cereals and their Industrial Uses.'

The Chemical Society

London: The Senate House, the University of London, 6.30-8.30 p.m. Reception and Conversazione.

The Fertiliser Society

London: 26 Portland Place, W.1, 2.30 p.m. Annual general meeting; 2.45 p.m. W. G. T. Packard: 'The History of the Fertiliser Industry in Britain.'

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. G. B. Harrison (director of research): 'The Research Laboratories of Ilford, Ltd.'

Society of Leather Trades' Chemists

Northampton: College of Technology, St. George's Avenue, 2.30 p.m. B. Barrett: 'The Practical Colour Matching of Leathers.'

Manchester Microscopical Society

Manchester: 16 St. Mary's Parsonage, Deansgate, 6.30 p.m. Microprojector evening.

Incorporated Plant Engineers

Newcastle-on-Tyne: Roadway House, Oxford Street, 7.30 p.m. Dr. E. G. Ritchie: 'The Use of Low-grade Fuel in Shell-type Boilers.'

FRIDAY, 9 MAY

Society of Chemical Industry

London: 4 Whitehall Court, S.W.1, 5 p.m. Plastics and Polymer Group, 20th annual general meeting, followed by lecture by Dr. R. F. Boyer (Dow Chemical Co., U.S.A.): 'A New Molecular Weight Distribution Technique.' 7.30 p.m. Informal dinner.

Royal Institute of Chemistry

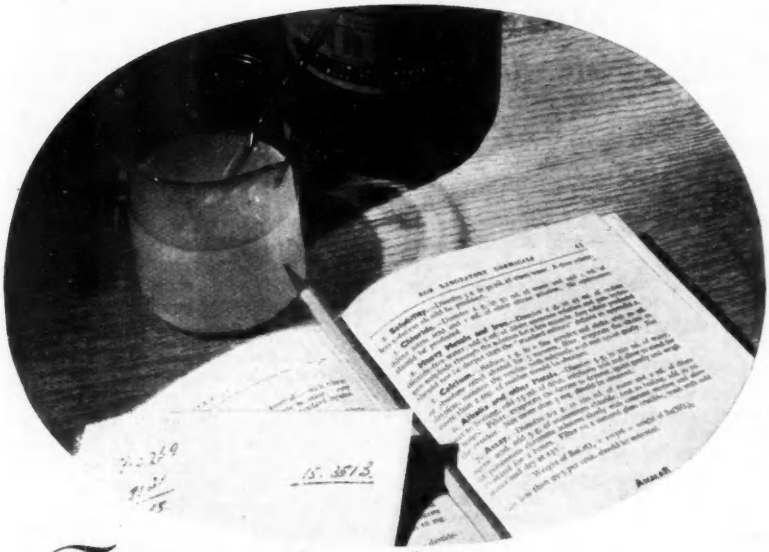
Dagenham, Essex: South-East Essex Technical College, Longbridge Road, 7.30 p.m. Dr. Norman Booth will open a discussion on 'Careers for Chemists.'

Society of Dyers and Colourists

Leicester: College of Technology, the Newarke, 6.45 p.m. The Ninth Mercer Lecture. Dr. F. C. Wood: 'Non-felting Wool and Wool Mixtures.'

Institute of Physics

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 7 p.m. Joint meeting of the Industrial Radiology Group with the Institute of X-Ray Technology. 'Quiz' on: 'The Design of Industrial X-Ray Equipment.'



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Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

FERRAMIC INDUSTRIES LTD. (M., 26/4/52.) Welwyn Garden City, manufacturers of chemical preparations, etc. 13 March. £50,000 deb. stock with a premium of £4 per cent payable in certain events, secured by a Trust Deed dated 4 March 1952; general charge and charged on a sinking fund policy. *Nil. 10 March 1951

New Registrations

Allen Chlorophyll Company, Ltd.

Private company. (506,132). Capital £1,000. Manufacturers and marketers of all types of chlorophyll and allied products; chemists, etc. Directors: Roger K. Allen, Reginald P. Merritt, K. C. Allen and Anthony W. Allen. Solicitors: Moreton Phillips and Son. Reg. office: 20/42 Wharf Road, N.1.

British Tungsten, Ltd.

Private company. (506,142). Capital £150. To carry on the business of buyer, sellers, storers and distributors of tungsten and tungsten bearing ores and concentrates, etc., and to enter into arrangements with Derby & Co., Ltd.; Metal Traders, Ltd., and H. A. Watson & Co., Ltd., etc. First directors: Nathan Isaacs, Eric Lunt and Maurice Murphy. Secretary: W. A. Tuckwell. Solicitors: Smiles & Co. Reg. office: 11 Ironmonger Lane, London, E.C.2.

Bronson Chemicals Ltd.

Private company. (506,732). Capital £100. Chemical engineers and manufacturers of and dealers in pharmaceutical, medicinal, chemical, industrial and other preparations and articles, etc. Reg. office: Broad Street House, 54 Old Broad Street, E.C.2.

Donald Leaver (Manchester), Ltd.

Private company. (506,361). Capital £500. Manufacturers of and dealers in new and second-hand machinery for the chemical and allied trades, etc. Directors: D. T. M. Leaver (chairman), S. P. Richfield, and R. C. Veitch-Clarke. Reg. office: 13/14 Parsonage Chambers, 29 Blackfriars Street, Manchester 3.

Industrial Mechanics, Ltd.

Private company. (506,772). Capital £100. Manufacturers of chemicals and chemical equipment. Director: D. C. Holland. Reg. office: 2 and 3 Denmark Place, Hornsey, N.

Labex, Ltd.

Private company. (506,877). Capital £100. Manufacturers of laboratory, chemical and scientific plant, apparatus and equipment, etc. Directors: C. Baker and W. Brook. Reg. office: 49 Ashtree Avenue, Mitcham, Surrey.

Manchester Oxide Company, Ltd.

Private company. (506,184). Capital £100. To purchase and sell any of the substances used in the manufacture of, or the production and purification of coal gas and especially to purchase and sell bog or other ore, ammonia water, tar, spent lime, spent oxide, etc. Directors: Terence Sloan and John A. Beaumont. Reg. office: Manox House, Miles Platting, Manchester, 10.

Widnes Oleum Co., Ltd.

Private company. (506,604). Capital £100. To carry on the business of chemical manufacturers; to enter into an agreement with Thomas Hedley and Co., Ltd., of the one part, and Peter Spence and Sons, Ltd., of the other part; and in particular to manufacture sulphuric acid, etc. Directors: Robert C. Wood, George H. Walton, Raymond H. Greenly, Francis D. Spencer, Frank S. Poole, and John Maddock. Solicitors: H. V. Mansfield. Reg. office: Phoenix Buildings, Newcastle-on-Tyne.

Company News

Brotherton and Co., Ltd.

The excellent results for 1951 shown by Brotherton and Company, Ltd., Leeds, may have been partly due to supplies of sulphur, which is essential to many of its manufactures, being better than had generally been anticipated. Net profit was £317,985 compared with £210,120, and was struck after all charges, including tax of £336,433 (£254,465). Final dividend of 7½ per cent was recommended, making a total for the year of 12½ per cent compared with 10 per cent for 1950.

Market Reports

LONDON.—Firm price conditions have been reported from most sections of the market, and there has also been a steady movement to the consuming industries against contracts. Although there has been no pronounced improvement in demand, there appears to be more interest in new business in some sections. A fairly active inquiry for shipment is reported, mainly for Empire destinations, but increasing competition in the chemicals and dyestuffs markets is being felt. Somewhat hesitant conditions obtain in the coal tar products market, and the volume of fresh inquiry has been small.

MANCHESTER.—The past week has seen little change in conditions for heavy chemical products. The wide range of textile chemicals continues in reduced demand and there has been less pressure for supplies from one or two other industrial outlets, but otherwise the home market has been steady and there has been little apparent falling off in the call for chemicals from the overseas markets. Prices generally are on a steady-to-firm basis.

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EDUCATIONAL

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SITUATION VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

SENIOR ANALYTICAL CHEMIST required to take charge of laboratory engaged on analysis of the non-ferrous and precious metals. Applicants should be of B.Sc. or equivalent standard and have had wide analytical experience. North London area. Salary from £1,000 per annum, according to qualifications and experience. Write, giving full particulars, to the **SECRETARY, JOHNSON, MATTHEY & CO., LIMITED, 73-83, HATTON GARDEN, LONDON, E.C.1.**

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48 M.S. Retorts or Vessels (conical) (2-in. porcelain lined), 6 ft. diam. by 5 ft. 9 in. deep.
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52 M.S. Tanks, 2 ft. 9 in. diam. by 3 ft. 9 in. deep (2-in. porcelain lined).
38 M.S. Tanks 3 ft. 2 in. diam. by 3 ft. 7 in. deep.
12 M.S. Tanks 4 ft. 6 in. diam. by 3 ft. 3 in. deep.
14 Stainless Steel Hoppers, 4 ft. 6 in. square. Each with automatic feed.
6 Vertical M.S. Tanks, 7 ft. diam. by 14 ft. 6 in. (tile lined).
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18 Stainless Steel Separators, 4 ft. 4 in. by 20 in. diam.
35 6-in. Stainless Steel Bends.
Also: Bakelite-lined Rectangular Tanks.
Cone and Dish-end Vessels.
Narkl Metal Pots. Various Steel Tanks.
Inspection by arrangement with:—
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CHARCOAL, ANIMAL AND VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal-insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH, LONDON," TELPHONE 3285 EAST**

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FOURTEEN various open-top **STORAGE TANKS** riveted, capacities from 300 gallons to 9,800 gallons Last used for oil or varnish.

1½, 2½ and 3½ size belt-driven DISINTEGRATORS by Christy & Norris or Harrison Carter.

Size No. 3 Junior Hammamac HAMMER MILL with fan and cyclone, also No. 1 size Miracle **GRINDING MILLS**

Robinson 3-sheet No. 1 size **CENTRIFUGAL DRESSING MACHINE** for dry powders etc.

Four **ROTARY BOWL MIXERS,** 5 ft. diam., cast iron built, inclined agitators by Baker Perkins.

Kek **GRINDING MILL,** square pin type, with grinding discs 13 in. diam., including circular delivery bin with single outlet.

Large unjacketed WERNER MIXER, belt and gear driven, hand tipping, double "Z" arms, pans 31 in by 45 in by 36 in. deep.

No. 200 One nearly new WERNER PFLEIDERER JACKETED MIXER OR INCOPORATOR. Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the to of the tipping screw.

No. 209 One HORIZONTAL "U"-SHAPED MIXER steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

Two **FILTER PRESSES,** each fitted 68 wood recessed plates, 2 ft. 8 in. square, centre fed, with enclosed bottom corner delivery, cloth clips and belongings.

One **DEHNE FILTER PRESS,** cast iron built, fitted 45 recessed ribbed plates, 2 ft. 8 in. by 2 ft. 8 in. by 1¼ in., with bottom corner feed, cloth clips and bottom corner separate outlets, angle lever closing gear, etc.

SIMON HORIZONTAL TUBULAR STEAM HEATED DRIER, barrel with steam-heated tubes, 12 ft. long by 5 ft. diameter

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13 IMPERIAL VACUUM CONCENTRATION FILTERS, Type 2, with washing equipment. Drum approx. 13 ft. by 8 ft. 3 in. diam.; approx. 320 sq. ft. filtering surface. Complete immersion of filter drum. Fitted double pendulum agitator, filtrate and wash water receivers, filtrate pump, mud pump. Drive through spur reduction gear from 4-speed gearbox.

15 Twin Unit **KELLY FILTERS** by Dorr Oliver. Capacity of each twin unit, 1,900 gals., and filter surface approx. 1,080 sq. ft. Pressure approx. 75 lb. sq. in. 20 filter frames in each unit, some clothed with Monel metal filter fabric. Filters mounted in fabricated steel frame with mechanically operated chain mechanism for removal of filter frames. Overall length of twin filter, 40 ft.

2 **ELECTROSTATIC PRECIPITATION PLANTS** by Siemens Lurgi Cottrell, each with twin insulated collecting chambers containing electrodes and shaking gear. Chamber dimensions, 62 ft. 6 in. high overall by 11 ft. 9 in. by 10 ft. Complete with fan, cyclone and dust collector and 20 kVA. transformer.

JAR AND BOTTLE CAPPER by Gravill. Capacity approx. 36 per min., with adjustment for various sizes. Morotised 220/240/1/50, through reduction gear. Unit mounted on C.I. stand with castor wheels.

Selas Type 9 **GAS AND AIR MIXING MACHINE,** comprising gas inlet governor, air and gas proportioning valve with vernier adjustment, back pressure valve, booster unit and delivery pressure controller. Maximum capacity, 25,000 cu. ft. per hr. air/gas mixture at adjustable delivery pressure.

BOTTLE RINSING MACHINE by Thomas & Hill. Chain conveyor type, 12 ft. centres, double row bottle fixtures, 132 hd. Rotary jet rinsing. Capacity, 150 doz. half or pint bottles per hr. Motorised 400/3/50.

Four Head **DOUBLE SEAMER** by Rhodes, for size A1 and AIT cans, complete with chucks to suit. Pulley drive.

Carton filling, packing, wrapping and labelling machine by **SOCIETE INDUSTRIELLE SUISSE,** adjustable for cartons from 73 mm. sq. by 38 mm. to 65.6 mm. sq. by 38 mm. Motorised 400/3/50. Complete with label attachments and heat sealing device. Conveyor feed approx. 55 per min.

LABELLING MACHINE by Rawsons, for pint or 16 oz. size flat or square. Capacity 24-30 per min. Numbering device. Motorised 400/3/50. Unit mounted on rubber-tyred wheels.

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Capacity, 8000 gallons,
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HYDRAULIC INTENSIFIER. Low pressure ram, 22 in. diam. High pressure ram, 9½ in. diam. Stroke approximately 5 ft. Ratio, 5½ : 1 to intensify from 800 lb. to 2 tons per sq. in.

SMALL 2-PLUNGER HORIZONTAL HYDRAULIC PUMP. 2 tons per sq. in. working pressure. Mounted on a tank.

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ONE "Centrac" Hand-operated Tube Folding and Closing Machine.

ONE SIFTER MIXER. 3 cwt. capacity. (New condition.)

5 cwt. (approx.) Refined **BEESWAX.**

7 cwt. (approx.) **PARAFFIN WAX.**

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4—30 ft. by 8 ft. diam. (dish end).
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1—26 ft. by 8 ft. diam.
1—28 ft. by 7 ft. diam.
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ONE 1,500 gallon m.s. welded construction, 40 lb. p.s.i. w.p.

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SEVERAL 40 and 60 gallon jacketed Pans in stock.

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Jacketed "Werner" **TILTING MIXERS** and Twin "Z" Blade **MIXERS.**
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TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.**
Stainless Steel **FILTER TANK,** 3 ft. 6 in. diam.
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CAST-IRON PIPES and **FITTINGS,** 200 tons.
VALVES in Stainless, Gunmetal, Enamel Lined.
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1 Barron **"D" MIXER, TROUGH** 30 in. by 18 in. by 18 in. Vee-belt drive to 2 H.P. motor, 750 revs. 400/3/50. As new.
One Werner Type **MIXER, TROUGH** 36 in. by 30 in. by 28 in. Twin "Z"-blades, power tilted, fast and loose pulley drive.
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IT is desired to secure the full commercial development in the United Kingdom of **BRITISH PATENT No. 620,807,** which relates to "REPEATEDLY IGNITABLE COMPOSITION," either by way of the grant of licences or otherwise on terms acceptable to the Patentee. Interested parties desiring copies of the patent specifications should apply to **STEVENS, LANGNER, PARRY & ROLLINSON, 5 to 9, QUALITY COURT, CHANCERY LANE, LONDON, W.C.2.**

NOTICE is hereby given that **LEWIS BERGER & SONS, LTD.,** seek leave to amend the Complete Specification of the Application for Letters **PATENT No. 640,836,** for an invention entitled "IMPROVEMENTS IN OR RELATING TO THE MANUFACTURE OF INTERPOLYMERS OF STYRENE WITH UNSATURATED FATTY ACIDS AND DERIVATIVES THEREOF."

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3297, dated 23rd April, 1952.

Any person may give notice of Opposition to the amendment by leaving Patents Form No. 36 at the **PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS, LONDON, W.C.2,** on or before 23rd May, 1952.

J. L. BLAKE,
COMPTROLLER-GENERAL.

THE Proprietor of **PATENT No. 586,282,** for "PROCESS OF PRODUCING A PLASTICISING COMPOSITION FOR HYDROPHILIC COLLOIDS," desires to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to **HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.**

THE Proprietor of **PATENT No. 599,683,** for "IMPROVEMENTS RELATING TO THE MANUFACTURE AND UTILISATION OF COLD SETTING POLYHYDRIC PHENOLIC ALDEHYDE ADHESIVES," desires to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to **HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.**

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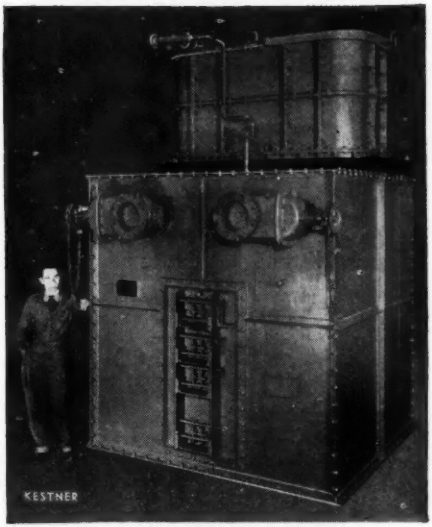

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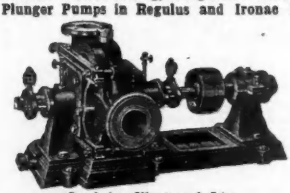

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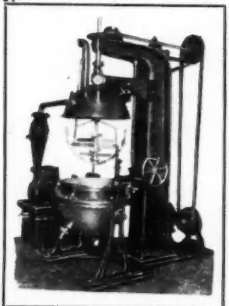

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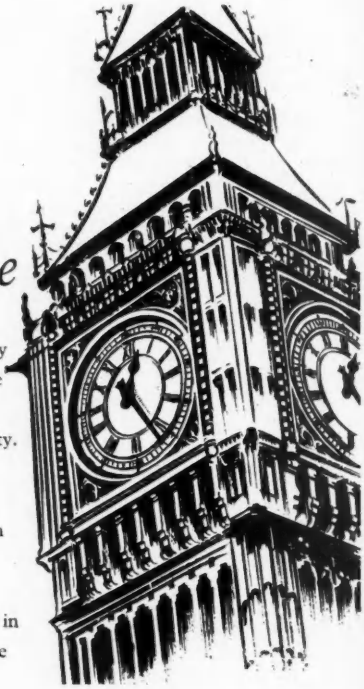

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